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CONTENTS.

An Asterisk (*) denotes an illustrated article.

OFFICIAL NOTICES—
- Thirty-third Annual Meeting, New England Association of Gas Engineers 121
- Tenth Annual Meeting, Michigan Gas Association 121
- Novelty Advertising Department, Ohio Gas Light Association 121
- Wrinkle Department, Ohio Gas Light Association 121
- Wrinkle Department, Western Gas Association 122

EDITORIALS—
- Briefly Told 122
  - Free Coal for One Year—Notes.
- An "Introspect" of a "Retrospect," by Mr. John Young 122
- Hints to Beginners and Young Gas Engineers, by Mr. Frederic Egner 123
- *The Future of Coal Gas and Allied Illuminants, by Prof. Vivian B. Lewes—Cantor Lectures—No. IV.—Concluded from Page 87 125
- The Gas Industry and the Manufacture of Cyanide 127
- Units of Light and Photometry 129
- Property Returns on Public Works 129
- *Natural Gas in Holland 130
- Electricity and Fire Insurance 131
- The Choice of Gas Fires, by Mr. Thos. Fletcher 132

ITEMS OF INTEREST FROM VARIOUS LOCALITIES 132
- Annual Meeting, Lebanon, Pa.—Mr. H. Richards in Charge at Honesdale, Pa.—Annual Meeting, East Newark, N. J.—The Fred. Bredel Company—Purchase by the Lawrence (Mass.) Company—The New Bern (N. C.) Plant Shut Down—Mr. W. T. Thecker Goes to Montpelier, Vt.—Extending the Powers of the East River (N. Y.) Gas Company—Annual Meeting, Hartford, Conn.—Ditto, Newport, R. I.—Something from Frederick, Md.—Annual Meeting, Atlantic City, N. J.—Personal—Hints from Lansing, Mich.—Something from Los Angeles, Cal.—And Other Items.

- The Market for Gas Securities 134

[OFFICIAL NOTICE.]

Thirty-third Annual Meeting, New England Association of Gas Engineers.

NEW ENGLAND ASSOCIATION OF GAS ENGINEERS,
OFFICE OF THE SECRETARY,
EAST BOSTON, MASS., Jan. 20, 1903.

To the Members: The Thirty-third Annual Meeting of the New England Association of Gas Engineers will be held in Young's Hotel, Boston, Mass., February 18th and 19th. The paper list at present carries the titles of 5 communications, and the Question Box has been well appealed to.

Formal notices will be issued shortly. In the meantime those wishing further information respecting the meeting should address the Secretary, as above. N. W. GIFFORD, Secretary.

[OFFICIAL NOTICE.]

Tenth Annual Meeting, Michigan Gas Association.

MICHIGAN GAS ASSOCIATION,
OFFICE OF THE SECRETARY,
ANN ARBOR, MICH., Jan. 12, 1903.

To the Members of the Michigan Gas Association: The tenth annual meeting of the Association will be held in Battle Creek, Mich., on Wednesday and Thursday, February 18 and 19. The headquarters of the Association will be the Post Tavern. Good accommodations are assured to all those who apply in advance. HENRY W. DOUGLAS, Secretary.

[OFFICIAL NOTICE.]

Novelty Advertising Department, Ohio Gas Light Association.

OHIO GAS LIGHT ASSOCIATION,
OFFICE OF SECRETARY, DELAWARE, O.,
January 20, 1903.

The Editor of the Novelty Advertising Department, Mr. B. W. Perkins, of South Bend, Ind., desires to announce that his department is now open for contributions, to be presented at the Nineteenth Annual Meeting, which will be held in Cincinnati, March 18th, 19th and 20th.

This department should prove very attractive for the convention. Its success, however, depends largely upon the active co-operation of the members. It is, therefore, earnestly hoped that the fraternity will not be backward in sending advertising schemes to Mr. Perkins.

T. C. JONES, Secretary.

[OFFICIAL NOTICE.]

Wrinkle Department, Ohio Gas Light Association.

OHIO GAS LIGHT ASSOCIATION,
OFFICE OF WRINKLE DEPARTMENT,
ST. PAUL, MINN., Jan. 17, 1903.

This department earnestly solicits the co-operation of the fraternity for contributions, to be presented at the Nineteenth Annual Meeting of

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the Association, which is to be held at Cincinnati, March 18th, 19th and 20th.

The Editor will be pleased to receive contributions not later than February, 14th.

E. E. EYSENBACH, Editor.
Care St. Paul Gas Light Company,
St. Paul, Minn.

[OFFICIAL NOTICE.]

Wrinkle Department, Western Gas Association.

WESTERN GAS ASSOCIATION,
OFFICE OF THE WRINKLE DEPARTMENT,
721 Citizens Building, Cleveland, O.

To the Members of the Western Gas Association: The Wrinkle Department is now ready to receive contributions for the 1903 collection, and I would thank you to please send a sketch or description of any new device or method you may have to the above address.

Any sketch, photograph or drawing, accompanied by a written explanation, of a new idea will be gratefully received, and it is hoped that you will comply promptly by favoring us with a contribution.

Respectfully,
W. E. STEINWEDELL,
Editor Wrinkle Department.

BRIEFLY TOLD.

FREE COAL FOR ONE YEAR.—The House and Senate showed how they felt on the coal question when, something over a fortnight ago, they passed an amendment to the Dingley tariff act, under the operation of which change all kinds and varieties of imported coals will be admitted into the United States for the period of one year, virtually free of duty. That is, the importer will be entitled to a rebate of the entire amount of the duty imposed under the Dingley act. We do not believe that this concession will amount to much so far as the gas makers are concerned, since the home material is so vastly superior for their purpose than is the imported "stuff" received during the recent struggle "for coal from anywhere," that the concession under the suspension would be virtually none. However, other manufacturers will benefit thereby, wherefore some good may come to some under the amending act of the government. The paragraph (415) of the Dingley act regulating the tariff impost on coal is as follows:

"Coal, bituminous, and all coals containing less than 92 per centum of fixed carbon, and shale, 67 cents per ton of 28 bushels, 80 pounds to the bushel; coal slack or culm, such as will pass through a ½-inch screen, 15 cents per ton of 28 bushels, 80 pounds to the bushel; *Provided*, that on all coal imported into the United States, which is afterward used for fuel on board vessels propelled by steam and engaged in trade with foreign countries, or in trade between the Atlantic and Pacific ports of the United States, and which are registered under the laws of the United States, a drawback shall be allowed equal to the duty imposed by law upon such coal. and shall be paid under such regulations as the Secretary of the Treasury shall prescribe; coke, 20 per centum ad valorem."

NOTES.—

AN application has been made to the borough authorities for the right to construct a gas plant at Clayton, N. J. It is the intention of the projectors to supply gas to the outlying districts of Glassboro and Pitman.

AT the annual meeting of the Saratoga (N. Y.) Gas, Electric Light and Power Company the Directors chosen were: E. T. Brackett, H. C. Todd, E. J. West, E. H. Gay and C. E. Parsons.

"A. R." FORWARDS the following, from Omaha, Neb., under date of the 19th inst.: "On the 15th inst., William E. Davis, local manager of the Omaha Gas Company, paid into the treasury of South Omaha $1,012.52 royalty on the business transacted in the city during the year 1902. Personal taxes to the amount of $1,384.35 also have been paid. Since the Gas Company commenced operations here in 1899 the royalties paid the city on its franchise amount to $2,785.42. The first year the royalty amounted to $207. The increase in the amount paid the city on a 5 per cent. basis shows the increase in business here. Gas mains are now laid to almost all districts of South Omaha, and extensions of the present mains are being planned for the spring."

THE purifying house of the Portsmouth (O.) Gas Company was damaged by an explosion some days ago. If one based his judgment respecting the damage on the accounts furnished by the "Associated Press" it would be hard to get away from the idea that the house was completely wrecked. The money loss amounted to less than $250.

AT the annual meeting of the shareholders in the Slatington (Pa.) Gas Company no change was made in the Board of Directors. The latter named the following executive management: President, W. L. Jones; Vice-President, Dr. A. L. Kistler; Treasurer, Jos. Richards; Secretary, H. E. Griffin.

[Prepared for the JOURNAL.]

An "Introspect" of a "Retrospect."

By MR. JOHN YOUNG, Allegheny, Pa.

In the issue of the JOURNAL for January 5th, I read, with a good deal of pleasure, "A Retrospect," by our genial friend, Mr. Frederic Egner. He hopes that his "Retrospect" will please those of the "Old Guard" who are left, and instruct (if possible) some of the younger generation.

I can hardly suppose Mr. Egner capable of sarcasm, but his "if possible" sounds a little as if, in his opinion, the younger generation were either incapable of, or else felt themselves above receiving instruction. In this I think he does our young aspirants for fame in the gas profession an injustice.

While their time and attention are largely taken up in working out the problems they have to face from day to day, I hope few of them are so egotistical as to think they have nothing to learn from those who preceded them. If there are any of that opinion I would advise them to seek some other profession.

Mr. Egner's "Retrospect" tells of both failures and successes, and from both our young men can, and doubtless will, draw lessons; from failures not repeat them, and from successes how they were attained. It may even prove profitable to investigate the causes of some failures. Some schemes were failures because they involved the impossible. These may be let alone; but there were others which possessed all the elements of possibility, but were failures, either through some defect in the process or in the apparatus, or because at the time they could not be made commercially successful. Some of these may bear looking into. A better process or more suitable apparatus might be invented, or conditions may have so changed that they may now be made commercially successful.

Part of Mr. Egner's "Retrospect" refers to a paper, read before the American Gas Light Association at its meeting held in Pittsburg, in 1882, by Mr. T. B. Fogarty, entitled: "A New Process for Making Water Gas." This was one of the most unique and boldest schemes ever presented to the Association. I suspect few of us at the time appreciated or gave Mr. Fogarty credit for the vast amount of research involved in getting at the data necessary to the production of such a paper, the ingenuity displayed in dovetailing so many separate processes into each other, making of them a connected whole, and the courage required to bring before such an audience a scheme involving such a radical departure from all the preconceived and traditional ideas of the gas fraternity. I think I am not far wrong in stating that, by the great majority of the members of the Association, the scheme was looked upon as a "chimera" involving the impossible; yet Mr. Fogarty showed very clearly that everything he proposed to do had already been done, and although what he calls the "keystone of the whole process"—viz.: the production of cyanides from atmospheric nitrogen and their conversion into ammonia—had not so far proved a success commercially, there could be no doubt as to its possibility. I have not yet heard of the success of the process commercially, but it may be only awaiting the man with the proper process and appliance to make it a success.

That carbonate of soda could be produced by the action of bicarbonate of ammonia on chloride of sodium was known to chemists many years before the Solvays invented the process which has made it the cheapest means of producing soda ash. Muspratt had so little faith in the process that, in concluding his article on the subject, he states: "That from the great loss of ammonia it can never become a success commercially."

At the time Mr. Fogarty read his paper very little was known about the Solvay process, even amongst gas men, but I think there are few amongst us to-day who do not know it is one of the largest markets for ammoniacal liquor. Another claim of Mr. Fogarty's, that all the nitrogen in the coal could be converted into ammonia, has been realized in the Mond producer.

Altogether the retrospect of Mr. Fogarty's process is very interesting and possesses features that may be worth looking into to-day. What more alluring field for the Napoleons of finance and science in these days of great combinations and concentration of interests than the combination under one management of the manufacture of the sodas (carbonate, bicarbonate and caustic), ammonia products (anhydrous, aqua and the various salts), cyanides in their various forms, and have as a residual gas for illuminating, gas for domestic fuel, gas for manufacturing purposes, gas for gas engines, gas, in fact, that would supersede all other means of heating, lighting and producing power.

Take a "Retrospect" from the natural gas business. At the time (1882) when the meeting of the Association was held in Pittsburg, natural gas and its possibilities were still in the womb of futurity. So

far as I remember, it was not even mentioned at that meeting, but very shortly afterwards it became a very live question, at all events around Pittsburg, and soon produced the usual crop of persons having patents and processes for improving it and converting it into all sorts of things. Amongst the first to appear on the scene worthy of mention was a gentleman, faultlessly dressed, of fine presence, aristocratic appearance and a military bearing, with a "down on your knees, sir," expression of countenance, that involuntarily sent your hand to your hat—nothing of the needy adventurer in the appearance of this gentleman. He was a voluble talker and had at command a wealth of chemical terms, all new and unintelligible to us, and which made us painfully conscious of our ignorance.

It ultimately dawned upon us that he was explaning a process by which he could convert natural gas into acetylene. "Acetyle" he called it, and what he wanted was a place in which to erect his apparatus and show to the world his wonderful discovery. My brother, who was then Superintendent of the Allegheny Gas Company, gave him the use of an unoccupied building on the works, and in this he erected quite a formidable looking apparatus, consisting of iron retorts, pipes, tanks, gasholder, etc. There were burners to show the light given by the gas in its natural state, and burners to show the light given after its conversion into acetylene. Day after day the experiments went on without showing any improvement in the illuminating power. Various alterattons in the apparatus were made, and at last he announced that success had crowned his efforts. We were invited to see acetylene burning in all its brilliancy. Sure enough there was a marked improvement in the illuminating power of the gas, but my brother's delicate sense of smell detected the odor of benzine, and his quick eye caught sight of a little tank placed away up in a dark corner of the building, from which he drew his own conclusion.

He had then a grand display prepared and invited a number of Pittsburg and Allegheny business men to come and see his process in action and the wonderful results produced. He described to them, in his jargon of chemical terms, the changes that had taken place in the natural gas in its passage through his apparatus, by which it was converted into "Acetyle" and produced the brilliant light they saw burning. But his "Nemesis" in the shape of my brother was close at hand. He began to question him as to the purpose of the little tank up in the dark corner of the building. Was it not filled with benzine? Was he not running the benzine from that tank through his retorts? Was the benzine not the sole cause of the improvement in the illuminating power of the gas, etc., etc.? Poor fellow; he tried to shuffle and evade, but it was no use. From the proud pedestal of the confident, self-deceived (which in charity we shall grant he was) he stepped down to the mortifying position of the attempted deceiver, caught in the very act. He attempted to repeat the scheme in McKeesport, Pa., but the "eclat" was gone, and after his failure there he and his "Acetyle," so far as I know, sank into oblivion.

The other man I referred to was of an altogether different stamp. Nothing aristocratic or autocratic in his appearance. A very modest, unassuming, somewhat bashful young man, with the thoughtful expression of a student on his countenance. His modest request was that my brother would allow him the use of his laboratory for a few days, as he wished to make some experiments with natural gas. It turned out that this young man, who was a good chemist, had theoretically figured out that, by taking the molecule CH_4 as a base, he could by a series of substitutions and additions build it up into the molecule $C_4H_6O_2$. In other words, that he could convert natural gas into "alcohol;" so many cubic feet of gas should produce so much alcohol. He began his experiments evidently without a thought of failure, but days lengthened into weeks and weeks into months and months into nearly a year, but he failed to produce even the smell of alcohol. When success, as he sometimes thought was the case, was just within his grasp, he would work day and night without intermission, and we were often afraid he would break down entirely. I don't think I ever knew such an instance of dogged perseverance. He also has passed out of our knowledge; but if perseverance counts for anything, he ought to succeed in the world.

It may be pertinent to inquire whether there existed a possibility of success in the theories of these two men. The products derived from benzol and other liquid hydrocarbons are almost innumerable, and chemists tell us that gaseous hydrocarbons can be cracked up at given temperatures to form other combinations. May it not be that the theories of these men were not at fault, but only their methods or apparatus? I am not competent to decide the matter, and it would be interesting to me, and might be to others, to know. Will someone who has the knowledge take the trouble, through the columns of your JOURNAL, to inform us?

[Prepared for the JOURNAL.]

Hints to Beginners and Young Gas Engineers.

By MR. FREDERIC EGNER.

Many of the older readers of the JOURNAL will remember occasions when they were asked by young men of their acquaintance, desirous to study the gas business, perhaps under their tutelage: "Can I get any books to help me; and what books would you advise? "We would probably tell the applicant that there were a number of good books to be had on the subject mentioned, but that much depended upon how deeply the student wished to go into it. There was "King's Treatise on Coal Gas"; but its cost was $30. Then there was "Hughes' Gas Works," only $1.65; while between were several good works, ranging in cost and usefulness between those named. We would mention "Newbigging's Handbook for Gas Engineers and Managers," which cost $6.50, or "Mooney's," which cost only $3, while at this time we might include the "Engineer's Pocket Book," by Henry O'Connor, costing only $3.50. Really, *we* thought, all of the books mentioned in the advertising columns of the JOURNAL were good books and worth having. We knew that every one of them contained matter which was at least not in that guise found in any other, and those of us who could afford it had them all and regarded them much in the same light as we do old friends and not mere acquaintances. We would perhaps tell the beginner that as soon as he could he should join one of the several gas associations, and of late years, when circumstances permitted, we would suggest joining the Correspondence Classes of the American Gas Light Association.

But we always recommended that the intending gas man should subscribe to, and never forget to read carefully, one or more of the American, and at least one foreign GAS JOURNAL.

This last bit of advice the writer regards even now the best that could be given to those who wish to become proficient and keep up with the procession in the profession of gas engineering as well as in the management of a gas business.

To it might be added this, that it is one of the best investments for the money a gas man can make, and infinitely more so if he not only reads but binds his JOURNALS and keeps them handy for reference. Let us see about that.

Taking up the two latest volumes of the AMERICAN GAS LIGHT JOURNAL (Volumes LXXVI. and LXXVII.), embracing the year just past, and making a brief examination through of the most pertinent contents for the beginner and for the busy man of actual working in the business as well, what do we find? On page 222, February 17th, 1902, we find "The City and Guilds' Examination in Gas Manufacture, London, England. Answers to Questions Set in the Honors' Grade in 1900." We find here a sketch of a regenerative furnace, and the following question, with answer:

"Describe with the aid of diagrams the construction of a regenerative furnace for heating a bed of gas retorts." "What should be the approximate composition of the producer and waste gases, and how may this be regulated?" Surely this is a most interesting subject, and in no book will the answer be found clothed in more simple, intelligible language than that afforded by "R. N.," in the *Gas World*, from which the said article was reprinted in the JOURNAL. The same article has the following: "Explain the hydraulic main, and give a sketch of this apparatus, showing the method of removing the tar and liquor which separate in it." Two methods are here described by illustration and word. I know of no book which gives the subject in nearly so great detail. And besides, it gives us in that description something which is of the latest improved, up-to-date construction. To learn all about something which was of an earlier date and was displaced by this method is interesting, of course, but not as important as the one shown in the publication mentioned.

The removal of ammonia and of carbon bisulphide from coal gas is not only illustrated, but clearly described. The article winds up with: "Give a description of the method of manufacturing carburetted water gas (exclusive of condensation and purification)." The writer can assure the "Beginner" that in no book whatsoever will he find these subjects treated more thoroughly, perhaps though with less brevity, yet not more intelligibly, than in this article appearing in one of the 52 numbers which he may receive in the course of only one year by subscribing to such a publication as herein mentioned. For the small sum of less than 6 cents per week; think of it! Do you think it worth while? Who of the readers of this article now have the number of the JOURNAL referred to? If you cannot find it, does it not appeal to you that it would be a pretty good thing to keep and bind the JOURNAL, just as suggested?

In that same number we shall find the "Official Notice" of the

Fourth Annual Meeting of the Southwestern Gas, Electric and Street Railway Association, whose proceedings will be found in a later number. Let us look over the paper list: "Progress Clubs in Texas," by the late Mr. E. H. Jenkins; "Fuel Oil," by Mr. W. W. Reed, of Houston, Tex.; "Flat Rate Evils," by Mr. Thomas D. Miller, of Dallas (now General Manager at New Orleans); "How to Increase Your Business," by Mr. A. E. Judge, of Tyler, Tex. All appeal to the young and to the old gas man; and as for the beginner, let me say that only a beginning has now been made to marshal before his eyes the treasures in the way of useful information given him, if he will but *take the trouble to read*, which is only too often sadly neglected by the busy man, who, however, has to pay for that neglect sometime, one way or another.

In the very same number in which a brief outline of the proceedings of the Association last mentioned is given, we find also the "Official Notice of the Eighteenth Annual Meeting of the Ohio Gas Association," which, although "Only a State Association," can be rated in point of interest in its proceedings, second to no other whatsoever.

Note the paper list of but one of the 18 meetings: "Equity, Legality and Advisability of Charging Different Rates for Illuminating and Fuel Gas;" "Distribution of Gas at High Pressures;" "Future of the Gas Business;" "Is there any Economy in a Full-Depth Bench over a Half-Depth; and Why?" "Can Iron Meter Connections be Used to Better Advantage than Lead?" "Are Loose-Leaf Ledgers Desirable for Gas Company Records?" "How May Complaints be best Cared for?" "Should an Individual Pressure Regulator be Used on Every Meter?" "Recent Developments in By-Product Coke Ovens;" "Recent Developments in Inclined Retorts;" "Coke Handling;" "Isolated Generator Firing of Benches;" "Domestic Water Heaters;" "State Regulations of Quasi-Public Corporations;" "The Best Way to Extend Gas Mains into New Suburban Territory, or New Additions; and the Best Way to Reinforce Insufficient Pressure in a Certain Section of a City." What a list of most interesting subjects, which, coupled with the discussions, comprise a symposium of practical and technical information unequalled in any of the numerous works for the use of students of the gas industry. But not *all* matters necessary to the beginner have been touched by the examples enumerated, therefore let us look further, and we need not look far. In the same number—not volume only—we have a synopsis of the proceedings of the "Mother Association" of them all, viz., that of "The New England Association of Gas Engineers," who held their 32nd annual meeting at Boston, as usual, in February of the past year.

Ten papers were read and discussed, besides which there was a report from a committee on "How Best to Sell Gas;" and the reader who may not know who Mr. C. J. R. Humphreys is must be very new in the gas business, and will gain something by making efforts to find out. But he may take it for granted that the Chairman of said Committee is an authority on the subject treated by the Committee. The papers presented were on the following subjects: "Distribution of Artificial Gas at High Pressures;" "House Piping;" "What is a Gas Company?" "A Model Coal Shed;" "The Advantages of a Card System in the Gas Ledger;" "Some Details in the Operation of a Lowe Water Gas Apparatus;" "Coal Gas Treatment;" "Candle Power Determination;" "Building Foundation for Steel Holder Tank on Quicksand Foundation;" "Gas Engines." Let the student remember that all these papers were by men who are more or less experts, and were all based upon work actually done. Again, referring to the valuable discussions which followed, the reader must see how valuable to him such matter must be. How, like no book, these papers must instruct and aid him, again emphasizing, "*If he will only read them thoughtfully.*"

Then follow reports of the proceedings of the Ninth Annual Meeting of the Michigan Gas Association, under the Presidency of Mr. Paul Doty, who is now beginning to be an "Old Gas Man" himself, though his friends hope he may not be considered so by the powers for many years to come, for it is somewhat of a serious handicap when a gas man's hair turns to the silvery, no matter what his professional attainments, character or physical condition may still be The student had better make a note of that item, and try to "Make hay while the sun shines." This is not the least in importance of the "Hints" given herein. The paper list at that meeting was not extensive, but good, as may be learned by reading. The subjects were: "The Building of a Water Gas Plant"; a report on "The Theory of the Incandescent Mantle;" also a lecture by Prof. E. D. Campbell, of the University of Michigan, the subject being "The Function of Original Research in a Technical Education," At the risk of becoming tedious the writer still thinks it well to recall the papers, by title only, read at the other Associations during the past year, believing that only by so doing can the object be fully served to benefit beginners and young engineers by this article. While the JOURNAL speaks for itself week by week, still when such a resumé of the year's work, as this is, can be brought before the reader in a single article, it will in a more striking manner exhibit the treasures which may have slipped through his hands as it were without special note.

In May we have a report of the Proceedings of the 25th Annual Meeting of the Western Gas Association, and it was "a red hot" one in more than one respect, as those who were there ruefully remember. The writer does, anyway.

The paper list was as follows: "Experiments on Bench Fuel;" "Gas Holder Specifications;" "Electrolysis;" "Beaumont Oil for Gas Making" "Some Experiences at New Orleans;" "Gas Engines;" Distributing Gas at High Pressure;" "Current Purifier Practice, and a New Form of Construction;" a paper by Mr. B. E. Chollar, which carried the Association away from gas apparently, and into the realm of speculative philosophy. And there was an unlisted paper upon the "Latest about the Inclined Retort System," just gleaned from a journey across the Atlantic to England, Scotland, etc., and the "Wrinkle Department," which most Associations have in one way or another. It is usually a feature of much value at our Association meetings as the reader may see by looking over the proceedings of those named, as well as the next one, viz: "Tenth Annual Meeting of the Pacific Coast Gas Association" where 8 papers were read and a lecture delivered, equal in interest to any of the preceding ones. The papers were on: "Fuel Conditions in California;" "Gas Advertising;" "Municipal Ownership;" "Differential Gas Rates;" "An Experiment on the Principles of Purification;" "Electrically Operated Appliances in Gas and Electric Works;" "The Recognition of the Engineer, with Especial Reference to Gas Engineering," and the lecture upon "The Methods of Determining Water and Sediment in Crude California Petroleum." The year closes as far as Association meetings go, by the "Thirtieth Annual Meeting of the American Gas Light Association," which is of such recent date, that but to complete this review, the writer would hesitate to rename the papers read upon that occasion. These were: "Some Notes on Cement Masonry;" "The Care and Maintenance of Incandescent Gas Burners;" "Gas Rates and a Franchise Tax;" "The Cleaning and Repairing of Gas Stoves;" "Why Milwaukee did not Build Inclines," and "A Test of a High Candle Power Incandescent Lamp." In addition there were reports on how best to keep gas companies' accounts, by men of recognized ability upon the subject.

Now let the reader consider it is reasonable to suppose that when a man is invited to prepare a paper to be read at any of these meetings, and before a critical audience of fellow managers and engineers, on a subject in which all are proficient and interested, he is likely to "give them the best he has in his basket," quoting from a favorite expression of a late President of one of the largest gas plants in America and the West. He must come to the conclusion that the information to be had in the columns of a publication such as this, specially devoted to the interest of the industry in which he desires to succeed, or to be instructed, is worth many times the price asked for it, even were that price a little more than double what it is, as is the case of most of the journals printed abroad devoted to the gas industry. The best work in print on the gas business is, if you will pardon the expression, "not in it" with any of these technical journals, when relative price and information are taken into consideration. For example: "King's Treatise on Coal Gas," price $30; that price will pay for 10 years' subscription, or if the volumes are well bound, for at least 7 years' subscription. And let you now compare the paper list given for the one year taken up, not to mention the still greater amount of reading matter provided outside of these papers, with the best book you know, and the verdict must be in favor of the JOURNAL. But, again, take to heart this bit of advice, "Bind your JOURNALS," so as to keep them, and the index furnished with them, together.

Among the "Proceedings" alone we shall find, exclusive of papers of purely local interest, and not to mention the Presidential addresses, which, coming from men ranking high in their profession, naturally should appeal to the careful perusal of all, the following subjects very thoroughly treated:

Business and administrative	9
Philosophical and educational	3
Pertaining to office work	3
Distribution (including consumers' meters, stoves, etc., and *the best*, most exhaustive and instructive article on electrolysis the writer ever read)	9
Candle power, and chemical determinations and operations including purification	7
Gas Engines	2
Petroleum (chemistry, and results with)	3

Water gas apparatus, construction and manipulation	2
Coal gas retort benches and appliances, the latest	8
Other gasworks apparatus	3
On gas holder building, and foundations	2
Masonry construction, of general interest	1

These comprise the papers to which in most instances the full text of the instructive discussions are appended.

The average cost of attending one of these meeting will be easily $50, from $25 for a "State Meeting" to $300, if one is wealthy enough to pay a visit to our Pacific Coast colleagues. But while no amount of reading can compensate for the greater benefit derived when one may visit these annual affairs and rub up against many a bright man, not to speak of the refreshing reunions sometimes had, still, the reading is worth while, and instead of the lowest rate mentioned, viz., $25, it will cost but $3 per annum for an American, and about $6.50 for a foreign Journal.

Perhaps it were best if the writer now concluded this article; but let us just glance at the annual index for a few items to make good the statement, in effect, that the "Proceedings" mentioned are "not the whole shooting match." We find, for instance, Mr. A. D. Adams reporting on "The Practical Value of the Nernst Lamp." It is an electrical device to be sure; but we want to know sometimes "what we are up against;" so that said article is worth while to read. "Analysis of the Portland Cement Industry, etc.;" "The Use of Lime in the Distillation of Ammoniacal Liquor;" "Danger of Incandescent Electric Lamps;" "Depreciation in Gas Plants," by Robert W. Prosser, and his name is given as one instance of the kind of men whose knowledge enriches the reader through the columns of the JOURNAL. But he is only one of hundreds who are helping the beginner, and the master as well, frequently by this medium, the JOURNAL, if the subscriber for his own sake will only take a little time to read what is provided.

Four articles on naphthaline troubles and the remedies can be found in that one year's (two volumes) issue. And so it goes. In short, some 1,200 items of greater or less length, all carefully indexed, may be found within the covers of one year's publication, always ready for reference, if only carefully bound and preserved. Always ready, just when you want or need it most. The most pertinent hint and advice to beginners and young engineers which the writer can give is, subscribe to at least one American and, if possible, one foreign GAS JOURNAL; read and inwardly digest them, have them bound and keep them as you would a treasure, which they may become more than once in an emergency, when you want good advice that you can rely upon.

[Concluded from Page 87.]

The Future of Coal Gas and Allied Illuminants—No. IV.

[The Fourth and last of a series of Cantor Lectures, delivered before the Society of Arts, London, England, by PROF. VIVIAN B. LEWES.]

As early as 1885 Mr. Arthur Kitson attempted to make a burner for heating purposes on the principle of injecting oil under pressure from a fine tube into a chamber where it would be heated by the waste heat escaping from the flame below. The vapor so produced was made to issue from a small jet under the pressure caused by the initial air pressure and the expansion in the gasifying tube. This jet of gas was led into what was practically an atmospheric burner, and drew in with it sufficient air to insure its combustion with a non-luminous blue flame of great heating power. At this date the Welsbach mantle was yet in its infancy, so that a mantle of platinum wire was at first used to obtain light from the flame. But like all other platinum mantles, although the light at first was very fine, the illuminating power rapidly fell off, owing to the action of the flame gases on the platinum. The perfecting of the Welsbach mantle, however, gave the finishing touch to this method of consuming the oil, and the Kitson lamp has now attained an assured success. The only drawback is that its use demands a certain amount of intelligent care; but where this has been forthcoming, the lamp has fully answered the high expectations formed of it.

In this lamp, as used for street lighting, the oil reservoir is in the base of the pillar. It is made of steel and tested to a high pressure in order to insure its being absolutely safe at the pressure at which it is used. A small pump enables the oil to be put under a pressure of air amounting to 50 to 60 lbs., by which it is forced up through a small capillary tube to the burner head. Here it passes through a small cross tube containing filtering material, for removing any solid particles in it, and is then ejected through a small aperture into a lower cross tube placed immediately above the top of the mantle, the heat from which, passing upwards, causes vaporization and partial gasification of the oil. The mixed gas and vapor rush out under considerable pressure from a small aperture in the side of the far end of the tube down what is practically an inverted bunsen tube, through the holes in the side of which it draws in sufficient air to render the flame at the burner head not only non-luminous, but sufficiently oxidizing in its character to prevent any deposition of carbon on the mantle. By the time the burner head is reached the gas is practically down to atmospheric pressure again, so that the wear and tear to the mantle is not excessive.

The difficulties that were found with the forms of this lamp in use down to 6 months ago were the occasional clogging of the small vapor hole with carbon and the risk that the oil might be turned on accidentally when the lamp was not in use or that a defective valve might cause a slight leakage of oil through the vapor tube into the burner, which might, under certain circumstances, have resulted in the auxiliary flame turned on to heat the vapor tube causing a slight flare. These objections have now, however, been surmounted. The vapor tube is made with a needle holder and needle running longitudinally through it, so that the small vapor hole can be cleared in case of any stoppage by simply pulling a small chain attached to a lever arm working the needle, while any any chance of oil escaping either from a leaky valve or from turning on the oil supply to the cold lamp is prevented by a thermostatic valve, which prevents any access of oil to the vapor tube until it is at a sufficient temperature to properly vaporize the oil. This valve operates by the difference in expansion of the two metals employed in its construction, and as long as the arm is cold entirely cuts off the oil. The valve being above the vapor tube it cannot get hot enough to release the oil until the vapor tube has got to the proper temperature.

These modifications are a distinct improvement. Other steps in the right direction are heating the air supply before it enters the mixing tube, and so doing away with any danger of condensation of the oil vapor, and also simplifying the general arrangement of the burner and preventing a good deal of the hissing sound which was an objectionable feature of the older type. It is satisfactory to find that the safety of the system is vouched for by the fact that out of the thousands of installations that have been put up in various parts of the world no fire has orignated from its use; and the progress during the past few years in new installations has been very satisfactory. One of the great advantages which it has over the intensified systems of incandescent mantle lighting, in order to obtain big units of illumination, is that it does not necessitate disturbing the streets, as the whole installation is self contained.

Careful experiments that I have made with this lamp show that with a large single burner it is perfectly easy to obtain illuminating values of from 1,000 to over 1,200 candles, and that with a large installation 1,000-candle power could readily be obtained for 1 penny, which is only one-third the cost of the same amount of light from the electric arc. The recent success of its adoption for the illumination of large open spaces in London and other cities points to the fact that it is destined to play an important part in the street illumination of the future.

Air curburetted with the vapor of light petroleum yields an illuminating gas of considerable value, and several attempts have been made to utilize this for incandescent lighting; one form which gives an idea of the systems most in use being that devised by Mr. Van Vriesland, which is used in several places under the name of "aerogene gas." In this arrangement a revolving coil of pipes continually dips into petroleum spirit contained in a cylinder, and air passed into the cylinder through the coil of pipes becomes highly carburetted by the time it reaches the outlet at the far end of the cylinder. The resulting gas when burnt in an ordinary burner gives a luminous flame, and can be burnt in atmospheric burners differing but little from those of the ordinary type. With an ordinary Welsbach "C" burner it gives a duty of about 30 candles per cubic foot of gas consumed, the high illuminating power being due to the fact that the gas is under a pressure of from 6 to 8 inches.

A complete installation of this plant is to be found at the village of Bruekelen, in the Pays bas, where it is used for street as well as house lighting. There are about two miles of mains, which in one place pass under a canal, and although one would expect in cold weather that there would be a serious deposition of the vapor, in practice this does not appear to be the case. It was found, however, that the evaporation of the carburetting material was much higher in the summer than in the winter, and this necessitated an adjustment of the air supply to the burners. When once this had been made, the lighting power of the installation was as high as before, and it worked in a perfectly satisfactory manner. I made tests of the light given by the mantles close to the works and also at a distance of half a mile away, after the gas had

passed below the canal, and found that there was a loss of only about 1 candle per cubic foot of illuminating power during distribution.

In considering the effect to be produced with the incandescent mantle by the combustion of gas in the atmospheric burner, we saw the great advantage of mixing the air with the gas, before combustion, at a point some distance from the burner head. Although this is of necessity done in using carburetted air, as in the Van Vriesland and kindred processes, yet a further extension of the principle gives greatly enhanced results, and gets over the difficulty which hampers all other processes, due to over-carburation in hot weather. In the Hooker process, which I have examined in conjunction with Dr. Boverton Redwood, the air is only carburetted to the point at which it gives a non-luminous flame; that is, nearly the whole of the air needed for the combustion of the petroleum vapor is mixed with it before combustion, and this mixture is then consumed in burners of special construction, which eliminate any risk of flashing back, with the result that a great gain in illuminating value is obtained. This process promises results of the highest importance.

A very ingenious table lamp for burning petroleum vapor with the incandescent mantle has been devised by Mr. Legge, in which a reservoir filled with sponge and other absorbent material is saturated with petroleum spirit containing the volatile hydrocarbons in solution. The vapor from this, descending by gravity to the burner head, draws in the required volume of air for its non-luminous combustion, and gives a light of about 40 candles when used with a mantle. Such a lamp has many points of convenience and value where coal gas is unattainable.

Yet another allied illuminant which has been steadily and quietly making headway during the past few years is acetylene, which, although the youngest member of the family of illuminants, is one which has already shown itself an important factor in illumination where coal gas cannot be obtained. I have so lately dealt with the subject in a previous course of Cantor lectures that there is no need now to go into the details of its rise to favor, or the methods by which it is produced from the electrically-born calcium carbide. Although much hampered in its progress by the determined booming of improper forms of apparatus that give rise to much trouble and waste, it has gone forward without a check, and improvements have been made in all directions.

There are several generators now on the market which leave little or nothing to be desired in their construction, as they are both simple and effective; and for country house lighting the beauty of the light has led to its firmly establishing itself as a favorite. In the early days bad generators and smoking of the burners proved real difficulties, but the improvements in burners as well as in generators have been of a marked character, and besides the excellent burners of continental origin Bray is now making some excellent ones, which show an improvement on the older forms of burner in that they can be turned down without any smoking. This will do away with the inconvenience which was inseparable from the older forms of burners, of either having to turn out the jet or leave it burning at its full size. The possibility of by-passing the gas and so keeping the burner low when not required will undoubtedly prove a great incentive to the adoption of acetylene for the lighting of country railway stations, in place of the dim religious oil lamps now in use.

The improvements which have marked the last few years in connection with acetylene are largely due to the labors of the Home Office Committee on the safety and efficiency of various forms of acetylene generators, and also to the work of an excellent Acetylene Association, which has been formed to deal with all matters relating to calcium carbide and acetylene, in the interests of the public and of the industry. The Association has already formulated regulations for the public guidance which have met with the approval of the Home Office authorities and also of scientific and practical men.

Like many new industries, carbide and acetylene have for a period suffered from over confidence on the part of many of its earlier supporters. On the Continent, where large water powers were available, factories were established one after another, as if it were only necessary to make unlimited quantities of carbide in order to insure a demand for it. The result of this was that for a time there was considerable over-production, and capitalists and shareholders interested in carbide works suffered severely in pocket, as, although the growth of the indnstry was wonderfully rapid, the supply was so great that stocks accumulated, and many factories had to close, whilst others worked to a small extent only of their capacity. The industry has, however, now recovered from this plethora of material, and this year there has been a danger of going to the other extreme, and at the present moment something closely approaching to a carbide famine exists in some countries. The price of carbide, however, has remained fairly constant, and even during the period when large stocks were being held it never fell to any very low figure, whilst so far the scarcity has not forced the price up to any great extent.

At the present time the annual consumption of carbide on the continent, for railway, domestic and village lighting, is probably not less than 40,000 to 50,000 tons, whilst in the United States and Canada the yearly consumption is not less than 20,000 tons; and fresh works are being erected to provide for the rapidly increasing demand. The colonies are being fed with carbide both from the European factories and from America. In Prussia something like 6,000 toms are used annually on the railways, which almost entirely employ a mixture of 25 per cent. acetylene with 75 per cent. oil gas for lighting all railway carriages, such a mixture giving a remarkably fine illumination. In England this system has not yet received a fair trial, as although the Home Office has sanctioned the use of such a mixture, the railway authorities have not yet done more than experiment with it in a very haphazard and unsatisfactory manner.

For the illumination of railway carriages, trams and omnibuses there is no doubt that acetylene has an enormous field before it. For some months the public in London were educated in the lighting power of acetylene as applied to omnibuses. Although, owing to the faulty form of generator employed, there was not only ample illumination, but also an occasional whiff of highly characteristic scent, at the same time it was realized that the ability to read the halfpenny press with ease and comfort gave the light a distinct advantage over the oil lamp which had previously made the darkness visible.

Unfortunately, there were difficulties in details which prevented this from proving economically successful. In the first place, acetylene generators, in which the supply of water to carbide is so regulated as to give the volume of gas required to feed the burners, in moving vehicles is under considerable disadvantages, owing to the jerking and jolting, which upset the arrangements for bringing the water uniformly to the carbide. The lamps being lighted at irregular hours and used for uncertain lengths of time was another difficulty to surmount. A charge of carbide sufficient for the maximum possible supply must always be put in the apparatus, and if at the end of the day carbide still remains undecomposed, there is no help for it but to remove it with the sludge, and to replace it by a fresh charge. Moreover, a large amount of labor is entailed in cleaning and charging, whilst there are very grave difficulties in dealing with the large quantities of lime residue in a big city like London.

These troubles, however, are now in a fair way to be satisfactorily overcome by the introduction of acetylene dissolved under pressure in acetone, the solvent itself being absorbed by porous materials with which the cylinder is filled. The early researches upon compressed and liquefied acetylene showed that it could be exploded under circumstances which made it inadvisable that it should be freely employed, whilst solutions of acetylene under pressure in acetone, although less liable to explosion, still could not be said to be sufficiently free from danger for general use. But it has been discovered by MM. Janet and Fouché that when the acetylene is dissolved in acetone absorbed by porous materials of the right kind, under 10 atmospheres pressure, it is impossible to produce explosion, even when electric sparks are passed through the containing cylinder, or platinum wires are fused in it. Exhautive tests which I have seen carried out in France demonstrate the absolute safety of acetylene compressed under these conditions; and these experiments have been corroborated both in Germany and in England.

Under this new system acetylene is evolved from carbide in the ordinary way, and after proper purification is compressed under 10 atmospheres into cylinders containing a porous medium of 80 per cent. porosity soaked with 43 per cent. of the capacity of the tube with acetone. In this way 1 cubic foot of cylinder space is found to hold 100 cubic feet of acetylene, which is again, to a large extent, given off when the pressure is reduced by opening the stopcock of the cylinder. Supplied to burners through proper regulating apparatus, this gives a magnificent illumination. Such cylinders, of small size, fitted to trams and omnibuses, are perfectly controlled by simply turning a cock, so that all waste of gas and trouble with residue and smell are obviated. As the system is now in the hands of the Acetylene Illuminating Company in London, who have done such good work in all branches of the acetylene industry, and as the Home Office have sanctioned the use of acetylene in this form, it may be expected that public opinion and competition with the "tubes" will, in the near future, lead to the abolition of the old petroleum lamp in tram cars and omnibuses and to the installation, in its place, of the more brilliant illuminant, especially as the difference in cost between the two only

amounts to a few pence per week. For railway lighting the same method can be adopted with large tanks of the same character as those now used for compressed oil gas, but filled with the right form of briquette.

From the earliest introduction of acetylene attempts have been made to utilize it with incandescent mantles, but under the pressures which are usually obtained from the ordinary generating apparatus this has been a practical impossibility. Although burners have been devised which for a short time gave a magnificent light with the incandescent mantle, the difficulty of preventing the flashing back in the burner tube, with considerable explosive violence that blew the mantle to pieces, was very troublesome to obviate. With acetylene under pressure in acetone, however, any desired pressure at the burner can be obtained, and with a pressure of 8 inches and upwards an acetylene burner can be made to work perfectly well with a mantle. The maximum illuminating power is obtained at a pressure ot 10 inches, when a light of 146 candles per cubic foot of acetylene consumed can be obtained. If the pressure rises above this point, although the total candle power is increased, the duty of the mantle falls. The results I have obtained are shown in the following table:

Acetylene with Incandescent Mantles.

Pressure. Inches.	Consumption per Hour. Cubic Foot.	Light. Candles.	Candles per Cubic Foot.
8	0.883	65	73.6
9	0.94	72	76.0
10	1.00	146	146.0
12	1.06	150	141.2
13	1.25	150	120.0
20	1.33	166	124.8
25	1.5	186	123.3
40	2.12	257	121.2

Another use to which the high pressure acetylene in acetone can be put gives promise of considerable commercial value, and depends upon the great calorific intensity which can be obtained from a flame of acetylene fed with oxygen. Many attempts have been made to utilize acetylene in this way, but the intense heat has always resulted in the choking of the burner by carbon, liberated in the form of graphite from the acetylene, which gradually closes up the jet in any ordinary oxyhydrogen blowpipe. A new burner, however, has now been devised which is so constructed that this trouble is surmounted, and a flame of enormous calorific intensity is produced, which is far greater than that obtained from the oxyhydrogen blowpipe, whilst, owing to the high temperature which exists in the flame, and which is well above the dissociation point of water, sufficient hydrogen is present to render the flame highly reducing. This flame can be utilized for the autogenous welding of iron plates, and also for cutting out the damaged portions of a plate, by fusing a series of holes round the damaged part; so that it seems probable that, with a little advance in the method of using, it may be possible to cut out the damaged portions of boiler and other plates and to autogeneously fuse in pieces of similar metal, which would undoubtedly be an enormous advantage.

I regret that I have now used up the time placed at my disposal, and also the review of my subject that I have been able to give has, of necessity, been so imperfect. In conclusion, I should like to tender my thanks to my assistants, who have been indefatigable in carrying out the experimental work brought before you, and to those gentlemen who have helped me by the loan of exhibits, whilst, last but not least, I must thank you all most heartily for the sympathetic attention you have given me.

The Gas Industry and the Manufacture of Cyanide.[1]

The *Revue Générale de Chimie Pure et Appliquée* for the 19th ult., contains the first portion of an article on the above subject, by MM. Robine and Lenglen. It is intended as an introduction to one which is to follow, dealing with the various processes at present applicable to the extraction of the cyanogen compounds in coal gas, ammoniacal liquor, and spent purifying materials. It necessarily partakes of the nature of a recapitulation of what has already been published on this question; but it may nevertheless be of interest to give an abstract translation of the communication.

The authors begin by pointing out that the cessation of hostilities in South Africa will make it possible to resume work in the gold mines. Indeed, this has been done to a certain extent; and before long all of them will again be fully employed. With this general resumption of labor, there will be a corresponding new flow of business, which will enable Continental manufacturers to dispose of the stocks they had been compelled to allow to lie idle during the war. This renewal of activity will introduce the interesting and long studied problem of the economic industrial manufacture of cyanides. South Africa, like all gold yielding countries, consumes a large quantity of cyanide of potassium, nearly all of which is furnished by Germany and England. Owing to competition, France remains in the rear, because the economic conditions of manufacture are unfavorable. The question is, however, worthy of more attention than it seems to have had. There are at present in existence three systems of manufacture of cyanides on a commercial scale: (1) The transformation of ferrocyanides into cyanides by alkaline metals or their alloys; (2) the synthetic process, by the action of atmospheric nitrogen on carbon in the presence of an alkali or alkaline metal, or by the action of ammonia on an alkaline metal alone or mixed with carbon; and (3) the extraction of cyanides as bye-products in the manufacture of gas. As a complete study of all these methods would lead the authors too far, they restrict themselves to dealing with the third.

During the last 30 years, the manufacture of illuminating gas has, as is well known, developed considerably in England, France, and Germany. Now, the cyanogen compounds are to be found ready formed in this gas, though, it is true, the percentage is rather low—sometimes almost at zero. But when the enormous quantities of gas made in various countries every year are considered, it is easy to see that those who are engaged in this industry furnish a very profitable source of these compunds. Moreover, cyanogen is a deleterious product, from which the gas should be freed before it is supplied for consumption; and consequently there is an absolute necessity, as well as an advantage, in extracting it, which can be done the more easily as it forms naturally during the process of manufacture.

In England first, and subsequently in Germany, this subject of the recovery of the cyanogen compounds attracted much attention, and manufacturers and scientists immediately recognized the amount of profit which could be derived from this idea in coal and gas producing countries like these. In France, on the contrary, as already remarked, but little attention seems to have been devoted to the matter; and even at the present time not much interest is evinced in extending the industry, notwithstanding the fact that in France 4,000,000 metric tons of coal are utilized annually for the production of gas, each ton yielding easily extracted products worth about 2 frs., which would realize the sum of 8,000,000 frs. (£320,000)—a by no means negligible amount. However, an objection may be raised that many French gas works are small, and the bye-products not of much value. To this it can be replied that most works belong to influential companies who own several; and it would therefore be quite easy for them to combine in some general scheme by which the whole of the products could be conveyed to central works for treatment, or sold to manufacturers for this purpose.

With these few preliminary considerations, the authors proceed to describe in detail the process of the formation of the cyanogen compounds during the manufacture of coal gas. They show that the distillation of coal in closed vessels results in the following products: (1) Illuminating gas, (2) coke, (3) tar, (4) ammoniacal liquor, and (5) spent purifying materials. The proportions of these products vary, of course, with the kind of coal employed, the duration and number of charges per 24 hours, and other conditions. Under ordinary circumstances, and with the usual coal, the following are the yields per 100 kilos. of raw material: Coke, 70 kilos. (about 1½ cwt.); tar, 3 5 to 6 kilos.; ammoniacal liquor, 6 to 9 kilos., of 1° to 8° Baumé, corresponding to 1 to 5 per cent. of pure ammonia; and gas, 30 cubic meters (1,060 cubic feet). As only three of the products—the gas, the ammoniacal liquor, and the spent purifying material—are of any interest in connection with their investigation, the authors deal with them successively. They first of all review the various theories put forward with regard to the formation of cyanogen compounds in the manufacture of coal gas, and show what are the reactions which may determine it. They point out that cyanogen compounds are formed naturally in the above-named process, and may be met with in the various operations in the following forms: Cyanogen, sulphocyanogen, sulphohydrocyanic acid, hydrocyanic acid, cyanide, ferrocyanide, and sulphocyanide of ammonium. The nitrogen requisite for the formation of these compounds originates in the coal, which contains various proportions according to its species—an average of from 1 to 1.60 per cent. The operation of distillation distributes this nitrogen among the various products, and only a small quantity is found in the state of cyanogen compounds. The late Professor Foster some years ago studied the migrations of nitrogen that occur in distilling coal in a closed vessel.[1] His experiments dealt with coal containing 1.73 per cent. of nitrogen; and he found that of this

1. *Journal of Gas Lighting.*

1. See *Journal*, Vol. XL., pp. 1081, 1124.

quantity 0.251 per cent. passed to the state of ammonia, 0.027 per cent. to the state of cyanogen, 0.863 per cent. remained in the coke, and 0.589 per cent. passed to the tar and gas. Herr Knublauch, who made similar experiments with three samples of coal, found the total nitrogen to be: (1) 1.555, (2) 1.479, (3) 1.176; the nitrogen in the form of cyanogen being respectively 0.0268, 0.0278, and 0.031. Herr Leybold shortly afterwards gave the percentage of nitrogen contained the following products as: Coke, 31 to 36 ammonia, 10 to 14; cyanogen, 1.5 to 2; tar, 1 to 1.3; and gas 46 to 56.[1] Reckoning Mr. Foster's total nitrogen as 100, the quantity passing to cyanogen was 1.56 per cent., while in the three samples of Herr Knublauch, similarly dealt with, it was 1.8. These figures show that the percentage of cyanogen compounds is relatively low; and therefore they could not be rendered profitable unless large quantities of coal were treated. The proportion depends mainly upon the temperature of distillation; cyanogen only being engendered in brisk distillations at a high heat. By carbonizing coal at a high temperature, Mr. Foulis found that 2.831 liters of gas gave 6.5 grammes of cyanogen; while at a low temperature the proportion decreased by more than one-half. According to Mr. Hunt, the most favorable temperature for the formation of cyanogen is 950° C. and upwards; and at 700° to 800° C. the amount is as much as twelve times less. This remark is confirmed by the fact, experimentally demonstrated, that the main portion of the cyanogen is formed towards the end of the distillation—*i. e.*, when the temperature is greatest; the amount of ammonia produced at this time being very slight. A small percentage of cyanogen, therefore, always corresponds with a high percentage of ammonia, and *vice versâ*. M. Perthuis made in 1895 a number of experiments which clearly demonstrate that such is the case, and that the production of cyanogen attains its maximum at the end of the distillation, whereas at the beginning it is almost *nil*.

The state in which the cyanogen leaves the retorts has caused much discussion, and opinions vary greatly. Some people maintain that it exists in the gas as cyanide and sulphocyanide of ammonium, which, meeting with sulphur and sulphide of carbon in the retort at a high temperature, would be partially transformed into sulphocyanide of ammonium. But, on the other hand, experiments conducted by Herr Bergmann clearly demonstrate that the action of ammonia on carbon or carbonic oxide at red heat does not give cyanide of ammonium, but hydrocyanic acid. According to Mr. G. P. Lewis,[2] this is the most probable result. The cyanogen in the gas cannot exist there except as free cyanogen or free hydrocyanic acid. He bases this view on the following principles: (1) Cyanogen cannot possibly exist in the gas in the form of sulphocyanic acid (CNSH); the latter being decomposed, in presence of hydrogen, into hydrocyanic acid and sulphuretted hydrogen. (2) It cannot exist as cyanide of ammonium, this salt being decomposed as soon as the temperature exceeds 26.6° C. (3) It is just as improbable that it is in the form of sulphocyanide of ammonium; experiments having clearly demonstrated this. Finally, other authors admit that cyanide of ammonium is formed, but that it is decomposed by the carbonic acid contained in the gas which would produce hydrocyanic acid and carbonate of ammonia. This explains the absence of cyanide of ammonium in the scrubbers. However it may be, formation of the cyanogen compounds takes place in the retorts at a high temperature, and probably results from the action of ammonia or carbon or carbonic oxide—an action which determines the formation of free hydrocyanic acid, which during its migrations through the various appliances is transformed. Cyanogen is found in ammoniacal liquor chiefly in the form of ferrocyanide and sulphocyanide of ammonium; the latter being only met rarely, and as an adjunct. Ferrocyanide of ammonium, according to Mr. Lewis, is due to the action of free hydrocyanic acid, in presence of ammonia, on sulphide of iron; being itself produced by the action of sulphuretted hydrogen on the iron frame of the condenser. With regard to sulphocyanide of ammonium, its origin is a little more obscure, and demands some further explanations. However, Mr. Lewis thinks, not without reason, that it is caused by the reaction of sulphide of carbon on sulphide of ammonium, the sulphide being itself produced by the action of the sulphur of the pyrites contained in the coal on the carbon at the distillation temperature.

The percentage of ferrocyanide and sulphocyanide of ammonium contained in ammoniacal liquor is relatively very slight. The average given by Mr. Lewis is 181 grammes of ferrocyanide and 286 to 907 grammes of sulphocyanide per ton of coal distilled. Herr Esop gives the following figures of experiments made at the gasworks of Wiesbaden, Karlsruhe, and Mayence:

Sulphocyanic Acid.	Ammonia.
1.22 per cent.	18.05 per cent.
1.51 "	19.03 "
2.33 "	36.05 "

Dr. Lunge says the amount of sulphocyanide of ammonium contained in ammoniacal liquor in English gas works amounts to 11 kilogrammes per 454 liters; though Mr. Playfair could never find more than 0.453 kilo. in this quantity. There is no reason to be surprised that ferrocyanide and sulphocyanide of ammonium, although both very soluble in water, exist in such small amounts in ammoniacal liquor, as this is merely due to the action of the carbonic acid, which decomposes these salts. On the contrary, we find cyanogen almost completely retained in the purifying material, and if we consult the table given by Mr. Lewis, it is easy to see that immediately after the passing of the gas into the first purifier, the amount of cyanogen products contained in it, which previously varied very little, decreases considerably, and that it is in the first purifier that the principal portion of the cyanogen products are formed. Herr Leybold had made similar experiments, demonstrating the progressive elimination of the cyanogen.

The purifying material consists of a mixture of ferric hydrate and sulphate of lime obtained by the reaction of lime on the ferrous sulphate—a mixture made porous by sawdust. The gas entering the purifiers contains sulphuretted hydrogen, ammonia, and cyanogen compounds. Somewhat complex reactions take place between the purifying material and these impurities, and, in particular, ferrous cyanide, ferrocyanide of iron, and ferrocyanide and sulphocyanide of ammonium are formed. Formation of the ferrocyanide can be explained in various ways. The hydrocyanic acid acts on the iron oxide to form ferrous cyanide, which in the presence of the oxygen of the air is transformed into prussian blue. But it results from Herr Leybold's experiments that if a current of hydrocyanic acid mixed with hydrogen is conveyed through the purifying materials, nothing is absorbed; whereas if the material is first saturated with sulphuretted hydrogen, the hydrocyanic acid is all combined, owing to the previous formation of sulphide of iron—the ferrous cyanide formed being subsequently transformed into prussian blue under the influence of atmospheric oxygen. Finally, others admit that the ferrous cyanide results from the action of cyanide of ammonium on oxide or sulphide of iron; and if the cyanide of ammonium is in excess, there is formation of ferrocyanide of ammonium. However this may be, the prussian blue is not formed direct in the purifiers, but by oxidation of the ferrous cyanide.

Humidity and the employment of steam favor the formation of ferrocyanides, and ammonia prevents it. Thus it is very important, when material rich in ferrocyanide is needed, to wash the gas as completely as possible, to free it from ammonia. Herr Knublauch succeeded, by almost completely removing ammonia from the gas, in obtaining materials containing as much as 24 per cent. of ferrocyanide. As a fact, ammonia greatly favors the production of sulphocyanides of ammonium or of iron. Herr Knublauch first demonstrated in 1877 the close relation between ammonia and sulphocyanogen and the formation of sulphocyanides at the expense of the ferrocyanides. If the gas has been sufficiently washed, sulphocyanide of ammonium only exists in a very small quantity when it reaches the purifiers; but it may be engendered in large percentages in these appliances, especially when the ammonia or sulphide of ammonium is in presence of free sulpnur finely divided, as it exists in old sulphuretted hydrogen purifying material. Herr Leybold studied this phenomenon, and analyzed two samples of purifying material, saturated with sulphuretted hydrogen, which had been subjected to the action of a mixture of hydrocyanic acid and sulphide of ammonium:

	$HCN + NH_3$.	$HCN + (NH_4)_2S$.
Water	23.60	33.02
Sulphur	24.98	11.39
Prussian blue	1.70	5.38
Sulphocyanide of ammonium	3.03	4.40
Ammonia	2.05	0.75

From these analyses it results that in the case of ammonia the proportion of sulphocyanide formed is greater than that of prussian blue, and almost equal to sulphide of ammonium. Presence of an alkali in the material also greatly favors the formation of sulphocyanides. During revivification of these materials, unless care is taken to prevent heating, formation of sulphocyanides at the expense of the ferrocyanides is itself very considerable, and Dr. Burschell estimates that it may attain as much as 30 per cent. of the ferrocyanides. This transformation is due to the action of the ammonia and sulphuretted hydrogen contained in the materials, favored by their moisture; also to the action of sulphur and alkaline sulphides on the ferrocyanides.

1. An article dealing with the investigations of Herr Knublauch will be found in the *Journal*, Vol. LIV., p. 832; and those of Herr Leybold were noticed in Vol, LVI., p. 1048.
2. See *Journal*, Vol. LXIX., p. 1049.

As can be well understood from this rapid glance at the complex reactions which accompany the formation of the cyanogen compounds, both in the gas itself and in the ammoniacal liquor and purifying materials, their production is closely connected with many conditions which the gas manufacturer desirous of recovering the cyanogen should endeavor to avoid or to bring about, according as they are or are not favorable for so doing.

Units of Light and Photometry.

The *Gas World* reports that Herr von Hefner-Alteneck, the originator, 19 years ago, of the Hefner amyl-acetate standard lamp which has found such wide acceptance on the Continent and in scientific circles, recently delivered an address on units of light and photometry before the Prussian Academy of Sciences, which has attracted a good deal of attention. Herr von Hefner Alteneck himself sees considerable room for improvement in his own lamp, and expresses some surprise that the lamp has remained in its original form all this time. We have, he thinks, from the nature of the case, no ideal uniform standard of light to rely upon, and the best we can do is to reproduce the conditions under which a satisfactory amount of light has once been produced, which we may agree to deal with as a standard unit. For this reason we should work always with the same kind of fuel for the lamp, some substance of definitely known chemical composition in a state of purity; and we must burn this in a simple lamp of definite dimensions, making the flame of a definite height. The flame literally hovers in the air, and has to be protected against disturbances; but in spite of this, this method of producing a standard source of light has been proved to present many advantages over the other methods proposed, the luminosity of white-hot bodies, for example, and it may be adhered to for the future. The history of the origination of the Hefner standard lamp shows that it ought not to be considered beyond the scope of improvement.

First came the question whether it would not be possible to make the whole thing larger, the present unit being a very small one. Many attempts have been made with differently formed flat burners, with hollow round burners, and many special constructions, to make a more powerful lamp; but in hardly any case was the flame steady, and where it was steady it never so much as came up to twice the power of the present lamp. The net result of these experiments was to make it clear that the present quantity of light and the circular wick tube must be adhered to.

Experiments were made to see whether the wick tube could not be got rid of and replaced by a simple hole in a metallic block. This would have been a great simplification; but it never gave enough light and took much too long to come to a condition of equilibrium. On the other hand, it was found that it would be of advantage to thicken the wall of the wick tube, since the tip of the flame was rendered steadier by this and the lamp was made stronger. The light fell off somewhat, but this could be adjusted by making the wick tube a little larger. The material of the tube also came under consideration, without as yet any decided results.

Then there came the question of the fuel employed. It is now beyond doubt that amyl-acetate, which was suggested at the first by Dr. Hannow, is, after all, not a definite chemical compound, but consists of two acetates. Practically this is, however, of not very much consequence, since both the acetates have the same lighting power, and no variation of lighting power arising from the preponderance of the one or the other has ever been observed. But a decided practical objection to the use of amyl-acetate is its powerful smell, which makes the lamp unpleasant to use, say, in private dwelling houses. Herr Ludwig Knorr has, therefore, at Dr. von Hefner-Altneck's request, investigated the possible alternatives to amyl-acetate. Among the pure chemical substances tried there were only three, acetyl-acetone, acetic ether and isobutyl acetate, which seemed promising; everything else either gave bad light or burned with a smoky flame, or else was too expensive. Of these three the first two are slightly acid and attack the wick tube. The third, isobutyl acetate, however, seems to meet all the requirements, and it is a definite chemical compound. It can be made quite cheaply, from ordinary fusel oil. This compound was among those tried 19 years ago, but at that time it was dear and very little known. Its lighting power is the same as that of amyl-acetate; but the lamp would have to be slightly altered to suit it, and perhaps the height of the flame would have to be somewhat different.

Mixtures of benzol and alcohol rapidly lose benzol upon evaporation or upon burning in an open dish; but in a lamp they do not fall off to any marked extent, because the liquid is drawn up by the wick and burned off in bulk. If they are so used in lamps, when there is more benzol than 1 part to 4 of alcohol, the flame smokes; between this and 1 part to 7 the flame is yellower than when amyl-acetate is employed. At 1 part to 7 the color of the flame comes right, but the lighting power is too low.

Herr von Heffner-Alteneck next dealt with the question whether a gas burner could not be made to serve instead. Acetylene, being a definite chemical compound obtainable in a state of purity, was the only material that seemed to meet his requirements. It would be useful to have an acetylene standard, because that would serve for photometry of the whiter kinds of light; and he is still working at this subject.

The great need at the present time is simplicity of construction with increased sensitiveness. Lummer-Brodhun and Martens photometer heads have proved a great advance; but the simpler types are of use, particularly in respect that they enable a judgmeut to be formed before the eye gets tired. In all such models, however, the method pursued has been to present both surfaces to the eye at the same time, for the sake of comparison between them. The images of the two illuminated surfaces then fall on different parts of the retina of the eye; but it is much better to bring these images in rapid alternation to the same part of the retina. It is very easy to show that this is so, and that without any apparatus. Hold a piece of white paper between the eye and a window and on the other side of it hold a black lead pencil. If this be held close to the paper there is a black shadow; as you take it farther away this shadow soon melts away and becomes indistinguishable; but if the black lead pencil be moved from side to side, athwart the line of light, the existence of the feeble shadow becomes strikingly manifest. An ordinary Bunsen photometer can easily be modified to make the paper travel back and fore at right angles to the grease spot; and if this be done the average of the errors of observation is reduced to one-third.

Herr von Hefner-Alteneck has himself contributed a new form of photometer with movable field, somewhat after the old Rumford type. The illuminated patches are presented on the surface of a white screen about 1.2 inches across, which has a dark space behind it. The sources of light are to the two sides of this and travel on rails which form equal angles with the surface of the screen. Instead of a shadow-forming rod there is an aperture in a sliding piece which can be thrown from side to side to allow the screen to be illuminated by light from one source or from the other. The width of this aperture can be adjusted so as to enable the illumination from the one source to be rapidly replaced by illumination from the other without a break. The observer is behind the screen and looks obliquely downwards at it with both eyes, with the aid of a mirror, against a background of absolute blackness. The advantages of this form of instrument are its simplicity of working, its diffusely reflecting and not transparent surfaces, quiet observation with both eyes together, the quick succession of the alternations, and the ease with which disturbing causes are prevented from interfering with the result. This type of instrument could not compete in sensitiveness with the Lummer-Brodhun or the Martens, but presents a marked improvement on the simpler apparatus for prompt and ready use.

Property Returns on Public Works.[1]

[By Mr. A. F. Bridgman, Auditor, Metropolitan Water and Sewerage Board, Boston.]

The taking account of stock or annual inventory of the merchant or manufacturer is so manifestly a part of his business system, and the care and thoroughness with which it is done is so clearly an important element in arriving at his business standing that no one doubts its necessity. On public works, however, the accounting for property used in the construction or operation of the works is often thought to be of little importance, and in fact when looked at from the point of view of the merchant or manufacturer, this may be true; but when it is remembered that a public work by its very nature requires regular and systematic statements regarding the means used for its prosecution, whether of men, money or appliance, the account of stock is seen to have its value.

When office furniture and fittings, engineering instruments, machinery, tools, appliances and materials for construction are purchased and delivered to a department for use in the work of construction or operation, there should be a thorough and systematic accounting for the same at regular intervals to some person who has entire knowledge of all supplies purchased and disbursed; and in general it may be said, the greater the work the more important are careful returns.

A brief outline of the methods adopted by the Federal and State governments and various commissions in charge of public works, will show how this matter is regarded. The United States government requires a property return from its disbursing officers at the close of each 3 months,

1. *Engineering Record.*

and the details of these quarterly returns are so elaborate as to make the return usually made on engineering work seem like play. The articles received and disbursed during each quarter are not only given in much detail, but the former are accompanied by the vouchers showing the source from which the property came, and the latter by the certificate of the person under whose direction the articles were used.

In some of the Massachusetts State departments a return is made semi-annually, showing property on hand at the beginning, the amount received during the 6 months, the amount used up and the balance remaining on hand. Of the commissions carrying on important public works in Boston and in the metropolitan district, the Metropolitan Park Commission has a general return of property annually. The superintendents of the different reservations make up their returns and send the same in book form to the Secretary of the Board, who compares and compiles the entire account.

The act under which the metropolitan water works are being constructed requires that a full property account be kept and an abstract of the same published in the annual report of the Metropolitan Water and Sewerage Board, which carries on that work. A property return is, therefore, compiled, showing all property on hand at the close of the fiscal year, and for articles not classed as perishable the amount on hand at the beginning of the year, as well as the amount received and disposed of during the year.

Members of the engineering profession do not as a rule look with unalloyed pleasure upon this work of recording and reporting the receipts and disbursements of property placed in their charge, and usually carry it to completion only under the stimulus of a forced draught. When a dam is to be designed or a road built the work is entered upon with the same zest that the well-known war horse is said to show when entering a battle, but when an inventory is to be taken and a return of the property compiled the task is approached with anticipations similar to those of a boy approaching a school house. And the reason is that a great responsibility for the good character of the strictly engineering work under his care has such a prominent place in his mind, and rightly, too, that the care and accounting for the means used in carrying on the work seems dull business. In other words, it seems a kind of a by-product of engineering work and an unprofitable one at that.

Now, how can a full and regular accounting for engineering property be obtained without making life miserable at stated times for the members of the engineering profession? First, by remembering that the accounting of property is like the accounting for money, and should be expected and planned for in a similar way, for unless one is willing to account for things submitted to his care, he should not accept the trust. Second, by entering property received in a book, in a similar manner to which cash received is entered, and, so far as is possible, stating what has become of property not on hand when each periodical account is rendered. Third, by using blanks which will cover the range of articles to be used, as far as may be foreseen, with plenty of room for additional items, a grouping of different classes of property under separate headings, so that any item may be easily placed, and entering items in each class in alphabetical order. When these things are done, the principal aids in the work will be at command.

For most engineering work, so called, the following general classification will be found to locate property in a natural way:

Office furniture, fixtures and supplies.

Engineering and draughting instruments and supplies.

Tools, machinery and appliances for construction.

Horses, vehicles and stable supplies.

Stock, i. e., material to be used in and in connection with the structures themselves.

Under each general heading place the items, grouping small classes of articles where practicable and avoiding too fine a separation of different kinds of the same article. The accompanying example will suggest a form of blank:

Property Return.—Tools, Machinery and Appliances.

	On Hand Last Account.	Received Since.	Total to Account for.	Disposed of.	Now on Hand.	Remarks.
Axes, all kinds	12	0	12	2	10	....
Barrows, wood	40	20	60	14	46	Worn out.
Barrows, iron	10	0	10	1	9	Broken.
Bars	34	10	44	36	8	4 lost in trench, 2 stolen.
Blasting supplies—						
Battery	1	0	1	0	1	....
Black powder, pounds	200	0	200	50	150	Used at dam
Dynamite, pounds	40	30	70	60	10	"
Fuse, feet	..	200	200	250	50	"
Leading wire, feet	..	500	500	..	500	....
Boilers—						
Horizontal, 10-horse power; upright, 25-horse power	2	0	2	1	1	Transferred to Road Dept.

In the general office, where bills are filed after payment, should be kept a book called the Property Book, and arranged as shown by the accompanying example:

Property Book.

Date of Bill.	No. of Bill.	Name of Article. Axes.	Sent to Sec. 1.	Sec. 2.	Pump. Sta.
Jan. 31	2,240	Wood chopping	12	..	..
Feb. 4	2,422	Hand	..	6	..
		Broad	..	..	3
March 1	2,690	Wood chopping	12	..	..

On most large works all bills after payment and before being turned over to the boskkeeper receive a consecutive nuumber and are thenceforward for convenience referred to by that number alone. If this method is not used the firm name may be entered instead in the second column. Each article has a half page, page or two pages, as is judged suffieient, and is indexed the same as in a letter book.

When the return is made by the different departments to the general office, the second column of the first table ("received since last account") is checked with the charges in the property book, and by this means it may be seen whether the property sent out has been accounted for, and in case of variance the difference can usually be adjusted by correspondence. Property received or disposed of by transfer from one department to another should be so noted in the column of remarks. A comparison of the two reports will then show a proper accounting. Property condemned as unfit for use should, to avoid uncertainty as to reporting it in future accounts, be marked as such, or be permanently disposed of.

The cost of making a complete report of miscellaneous property as outlined above will be found to be about 1 per cent. of the value of the property reported.

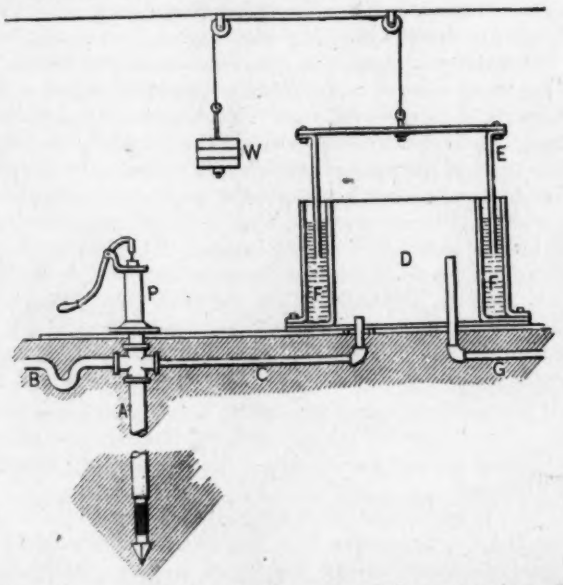
Natural Gas in Holland.

Mr. Chas. P. Hauss, writing in the *Metal Worker*, on the topic named in the heading, says:

When I called on a customer in Amsterdam, Holland, not long ago, I was surprised to see a Dutch farmer, with balloon trousers and white-washed wooden shoes, enter, and much more surprised to hear him ask to see gas fixtures and gas stoves. As he looked every inch a back-countryman, I asked my friend what use could a farmer of his type have for gas fixtures and where he could get the gas, to which I received the response: "They use the gas that rises from the water in their driven wells."

It is well known that much of the land in Holland is below the sea level, hence it is not necessary to drive a well very deep to secure a constant stream, or rather supply, of good water. Investigation has shown that many farm houses have gas light and heat, and some large factories are supplied at once with water and gas from these artesian wells.

The method ordinarily used is shown in the sketch herewith. An



ordinary artesian well is topped with a cross fitting, on top of which is a tight pump. One of the side branches, *B*, is the water supply to the

house tank, and the other side is the gas supply, *C*, which carries the rising gas into the gasholder or reservoir, *D*, which should be of sufficient size to store enough gas for 48 hours' supply. The bell, *E*, which is perfectly counterbalanced by the weight, *W*, rises and falls in the water-filled space, *F*, as the volume of gas increases and decreases, and at the same time can be so weighted as to give the necessary pressure. The pipe, *G*, carries the gas from the reservoir to the fixtures.

Electricity and Fire Insurance.

Electrical World reports that at the 230th meeting of the New York Electrical Society, held at the Lecture Room of the American Institute, on Wednesday evening, January 7th, 1903, the subject for consideration was "Electricity and Fire Insurance." Dr. Samnel Sheldon, president of the society, after some appropriate remarks in opening the meeting, introduced Mr. Joseph Sachs, who spoke on "Electric Fuses in Relation to the Insurance Hazard." Mr. Sachs sketched the development of safety fuses and then proceeded to consider the inclosed fuse in detail. Referring to the matter of fuse rating, he considered fuses should be rated at their maximum fuse load capacity; that is, the maximum number of amperes which will flow continously through the fuse without injury. The underwriters, however, consider that a fuse shall be rated at 80 per cent. of its maximum continuous current-carrying capacity. Some manufacturers put both ratings on the label and leave it to the user to decide whether he wants to run the device at its maximu current or at eighty per cent. of that maximum. The time interval of overload enters here, for when a fuse is rated at 80. per cent. of its maximum current, there will not be accurate overload operation.

The inclosed fuse is particularly adapted to the protection of devices where time interval is a desirable quantity ; and in many cases some time limit of operation on overload is desired. Mr. Sachs brought out the fact that after an inclosed fuse has been blown the external structure of the fuse may be used again.

President Sheldon then introduced Mr. Arthur Williams, who spoke on the subject, "The National Electric Code and High-Tension Circuits." After sketching the history of underwriters' codes, he referred to proposed action concerning high-tension transmission lines passing through hamlets, villages, towns and cities. Heretofore there have been no codified rules covering their installation and use, and until recently such as were suggested practically prohibited them. Such prohibition has been recognized as unnecessary and harmful to the industry, though the desirability for sure control as to where placed and the manner of construction, has been recognized. Hence, the recent action of the insurance and electrical authorities, interested in the National Code, and the considerable, though not as yet final, progress toward an addition to the Code, by which, while the electrical industry will not be retarded on the one hand, the insurance industry will not be subjected to abnormal risk on the other. The risk cannot be of fire, as these transmission lines rarely, if ever, enter premises other than those owned and operated by the electrical companies, but rather of the proximity of property to high-tension wires, causing at least hesitant action on the part of firemen in approaching a burning building, and thereby possibly allowing a fire to gain headway, and causing a larger loss than would have occurred were there no obstacles before the firemen, delaying their movements. The new code will relate chiefly to the method of line construction, the distance which the wires must be carried from buildings and from the conductors of other light, power and signaling systems.

The next speaker was Mr. J. C. Forsyth, who spoke on "The Relation of Electricity to Insurance Rates." There have been, he said, many reports of late (and their number is constantly increasing) to the effect that old equipments are rapidly deteriorating and becoming more and more of a hazard to both buildings and contents. This fact is borne out by statistics which show the record of fires from electrical causes. During the past fifteen months the electrical department of the New York board has secured the expenditure of at least $175,000 in the territory over which it has jurisdiction in re-equipping and overhauling old installations which had become so defective that their continued use was liable to result in serious loss. Equipments have not been condemned simply because they were old, or that out-of-date appliances were found to be in use, but wholly on the grounds of deteriorated conditions of insulations and apparatus. The board, moreover, has but scarcely started on this line of work. These conditions together with the fact that changes, alterations and additions are constantly being made which for very obvious reasons are not reported for inspection, raise a feeling of insecurity in the minds of practical insurance men, which unless removed or abated may result in what many of them now think to be the only proper step, viz., the making of a flat increase in rate on all buildings and contents, where electricity is used.

The general tendency toward higher potential is also cause of uneasiness; the old 2-wire, 110-volt system, has given away in rapid succession to the 3-wire, 110-220 volt, the 2-wire 220, and now we have in many sections of the country a 220-440-volt system. In fact, the only limit to the potential which appears to be regarded is the commercial efficiency of the lamp or current-consuming device. With every increase of the potential there is without question an increase of hazard. This hazard may be guarded on new equipments, but changing old installations from one system to another of higher voltage should not be done. New equipments become old in a very few years, and then we will be face to face with the same problem. Without doubt, however, should a flat increase of even ten cents be made when electricity is used for any purpose, the inevitable result would be to practically prohibit installations in thousands of buildings where it is at present in use, and where now considered much more of a luxury than a necessity,

Dr. A. E. Kennelly sent a statement concerning the action of the American Institute af Electrical Engineers on the proposed high-tension underwriters' rules, which was read by President Sheldon. In 1901, he said, the U. N. E. Association promulgated certain proposed new rules affecting the construction of extra high-pressure electric transmission circuits. They considered that these extra high-pressure circuits increased the fire hazard on insured property in the neighborhood, partly by physical obstruction of firemen who could not or would not attempt to cut the wires, and partly by accidental crosses with low-pressure circuits entering buildings. These rules contained a 75-foot distant limit from buildings, and were evidently intended to exclude extra high pressure wires from settled districts. The proposed rules were so drastic as to elicit protest and expostulations from transmission companies and engineers.

The Board of Directors of the Institute sent printed copies of the underwriters' proposed new high-pressure rules to a considerable number of members of the Institute for comments. A goodly number of vehement objections were returned, and these were turned over to the Institute's Code Committee.

After preliminary meetings the Institute committee met the underwriters' committee at a conference in February, 1902, and a number of tentative joint propositions were drawn up for presentation to the respective governing bodies. The directors of the Institute sent copies of these joint propositions to its members for comment. A number of replies were received during the summer of 1902. General satisfaction was expressed by many replies at the tenor of the propositions; but, in detail, many modifications were suggested.

The entire correspondence was considered by the Institute committee at a meeting in November, 1902. At this meeting the views of the committee were recast. The membership of the committee had also been modified since the preceding year. The recast opinions of the committee were forwarded to the underwriters' committee, with a request for another joint meeting. The joint meeting was held on November 18, 1902.

At the joint conference a number of joint resolutions were adopted, representing the matters upon which an agreement was reached. The joint recommendations for proposed new rules affecting the construction of extra high-pressure constant-potential circuits was submitted to the respective governing bodies.

The directors of the Institute held a special meeting to consider the proposed new rules as set forth in the joint recommendations. The meeting was held on December 8th, 1902, the day before the annual convention of the U. N. E. Association in New York. In view of the objections raised by certain associations and individuals, and in view of the short space of time in which to secure opinions, the directors decided to ask the U. N. E. A. for a further postponement of action. President Scott attended the convention on December 9th, and presented the request, which was acceded to.

The directors of the Institute have recently issued copies of the new joint recommendations to individuals and corporations interested in the matter of an expression of their views. It is expected to hold a committee meeting on the replies in the near future. Since a number of replies have been received expressing satisfaction at the recommendations, it is reasonable to hope that these recommendations will need but little further ratification to meet with general favor.

A discussion by the members of the society, of the topic of the evening followed, in which Messrs. Patterson, Osterberg, Petty, Cook, Eidlitz and Lorrain participated.

The Choice of Gas Fires.

[By Mr. Thos. Fletcher, in *Journal of Gas Lighting.*]

The choice of gas fires is a matter of importance to all; and there is no doubt that if the subject were properly understood, and the prejudice which undoubtedly exists against gas fires could be removed, their use would be extended in a manner at present considered impossible. Having been more or less of an invalid for some years, I have had unusual opportunities for judging, not only of the comparative values of different systems, but also of the curious prejudices which seem to dominate the minds of many, who will not even allow their own common sense to guide them. One unfortunate point, which perhaps has done more to damage the reputation of gas fires, is the persistency with which people will attempt to use them where a down draught exists. The common remark is that they cannot have a coal fire because of the smoke, and therefore they will have a gas fire. Of course, it is not a success; and then people say that gas fires are a total failure—that they tried one and will never try another. To attempt to show them that the failure is entirely the result of their own fault is as effective as arguing with a stone wall.

A very large proportion of medical men, on entering a sick room, will at once insist on the removal of a gas fire. It may have been in use, with perfect comfort and success, for years; but this they totally ignore. They will not listen to any reasoning, or even have the fire tried in their presence; it must come out. They tried one once, and it smelt, etc., etc. Out it comes, to be replaced by a dirty, noisy coal fire, which is so irregular that equal temperatures and atmospheric conditions are impossible. Very few patients will fight the matter out; but when they do, and the gas fire is what it ought to be, a useful convert is obtained.

The same remarks apply with quite as much force to trained nurses. One I had told me she had always had gas fires removed from sick rooms—not from prejudice, but because, in her long experience, she had never seen one that was satisfactory. They always smelt badly, or they gave no heat. She soon altered her opinion after the experience of a few days and nights with my own, which was an ordinary iron-fret fire, nursery pattern, with boiling burner on the top; and she is now as strongly in favor of gas fires as previously she was prejudiced against them. The same result occurred with my medical attendants. Instead of being determined to have the gas fires out of the room, they have now adopted them in their own homes and consulting rooms. One tells me that when he is called out in the night he warms some soup, or makes a cup of coffee while dressing; and so saves himself many a chill and risk of illness. When he returns, it is to a warm bedroom and more warm food, if his absence has been prolonged.

In children's night nurseries, among the little folks who, in the same day, will be in perfect health and then at death's door, a gas fire and a quick supply of hot water, so easily obtained by gas, are a boon beyond any possible money value—actually, in many cases, a matter of life or death.

A very common question is: Which is the best gas fire? There is no "best" for all purposes, but there is no possible doubt that, as a matter of comfort and health, by far the larger proportion should be radiant. Warmed air is much cheaper to obtain with any fuel; but this does not give the feeling of comfort, nor is it possible, without radiant heat, to keep the floor and feet warm—a fact easily proved by placing thermometers at different heights. I have repeatedly observed a difference of more than 60° between the floor and ceiling temperatures in rooms where a hot air stove is used. This means cold feet and a headache to anyone sitting quietly in the room for any length of time.

This brings me to one point as regards heating which is, and has been, an unsolved mystery. Anybody who uses one room regularly would naturally think that, if the temperature were kept steady at 65 F., the feeling of warmth would be always the same; whereas the room may feel sometimes warm and sometimes uncomfortably chilly under apparently identical conditions as regards ventilation and outside temperature. At first, I thought this could be explained by the varying amount of moisture in the air; but continuous watching of the hygrometer and thermometer together shows clearly that this is not the case. What the cause is I am totally at a loss to explain, or even to imagine; and it is quite evident that the matter of personal comfort is not to be judged by the thermometer or the hygrometer. There is an unexplained personal element which has to be considered. A steady temperature in a sick room is not, in itself, sufficient. It must be varied according to the feeling of the occupant; and this is only possible with a good gas fire. All the skill in the world will not make a room always comfortable where a coal fire is used. It is far too unsteady, and too little under control.

Another most important point is the quick warming of food, etc., and, as a matter of practical experience in my own case, a night rarely passes without the small boiling burner being required. The same thing will occur, often both night and day, in nurseries. In many houses there is a room that is set apart as a "den"—a private retreat for the master of the household and his friends; and a good gas fire makes this comfortable at a much shorter notice than a coal fire, without the dirt and trouble. But, in this case, it is necessary to have the fire of ample power, with a large margin, so that the room can be used with comfort at a few minutes' notice in all weathers. A fire which is barely sufficient loses one of the greatest advantages.

As will be seen in our advertising columns, the Cincinnati (O.) Gas and Electric Company is asking bids for its coke product, the output of which now reaches the annual total of 4 million bushels. The Marmet Coal Company has been taking the coke since 1898, under a 5-year contract, which expires in July. In fact, the Marmet Company has been the purchaser of the Cincinnati Company's coke output for 25 years.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

At the annual meeting of the shareholders in the Lebanon (Pa.) Gas Company the regular semi-annual dividend of 4 per cent. was declared. The officers elected were: Directors, L. E. Weimer, John W. Mish, H. C. Grittinger, C. H. Killinger, Gen. J. P. S. Gobin, R. Bean and W. W. Mish; President, L. E. Weimer; Vice-President, H. C. Grittinger; Secretary and Treasurer, John W. Mish; Superintendent, W. H. Merritt.

The Consolidated Gas and Electric Light Company, of Honesdale, Pa., has named Mr. Henry Richards as Superintendent. The Company's new offices are in the Baumann Building.

At the annual meeting of the East Newark (N. J.) Gas Company the following Directors were elected: Wm. J. Davis, Geo. R. Gray, U. H. McCarter, Randal Morgan, Spencer Weart, H. M. Barrett and Jas. P. Dusenberry.

The Niagara Falls (N. Y.) Gas and Electric Light Company is arranging to extend its mains to and through the town of Wheatfield.

The business heretofore carried on individually by Mr. Fred. Bredel, of Milwaukee, will hereafter be carried on by a corporation to be known as the Fred. Bredel Company, with headquarters at 118 Farwell avenue, Milwaukee. The Company is capitalized in $25,000, and the incorporators are Fred. Bredel, Wm. O. Vitter and Emil Rom.

The Clinton (Ia.) Gas Light and Coke Company has notified the Secretary of State that it proposes to increase its capital stock from $200,000 to $550,000.

The proprietors of the Lawrence (Mass.) Gas Company have purchased the property on the southwest corner of Amesbury and Essex streets, and the buildings thereon. The Company's offices have been located in the named premises for several years under leasehold.

The plant of the New Bern (N. C.) Gas Light Company was shut down some days ago. Inability to secure anthracite coal was the reason for this action.

On the 1st of August the Grand Rapids (Mich.) Gas Company will reduce the selling rate to 90 cents per 1,000 cubic feet. The Company's business shows remarkable gains.

At the annual meeting of the Mohawk Gas Company, of Schenectady, N. Y., the officers chosen were: Directors, Chas. F. Coffin, J. A. Van Voast, E. F. Peck, H. Parsons and E. C. Angle; President, Chas. F. Coffin; Vice-President, Jas. A. Van Voast; Treasurer, E. F. Peck; Secretary, E. C. Angle.

Mr. W. J. Thecker, formerly in charge of the distribution service of the Consolidated Gas Company, of New Jersey, has been appointed Superintendent of works by the proprietors of the Capital City Gas Company, of Montpelier, Vt., the plant of which is now in process of construction.

Assemblyman Remsen has introduced a bill in the Legislature of New York, which is evidently meant to perfect the franchise of the East River Gas Company (now controlled by the Consolidated Gas Company) in so far as its operations in the districts named are concerned. The original law incorporating the Company was passed in 1902, and the present bill is an amendment to Chapter 338 of the laws of that year. The amendment provides "and subject to the annual payment of three per centum of its gross receipts from gas as by this act required and to all other obligations and reductions hereby imposed by this act, the said East River Gas Company, of Long Island City, its successors and assignees are hereby empowered to exercise in the present city of New York (excluding the Boroughs of Brooklyn and Richmond, and that portion of the Borough of Queens not included in the former city of Long Island City, and in the former town of Newtown but including that portion of the 24th Ward amended by Chapter 934 of the laws of 1895), all the rights, powers and privileges conferred upon the said Company by this act."

At the annual meeting of the Hartford (Conn.) City Gas Light Company no change was made in the Board of Directors. The executive management named was: President and Treasurer, Gen. John P. Harbison; Secretary, Thomas Evans.

The La Grange (Ills.) Gas Company will extend its mains to Hinsdale this season. Col. Copley evidently intends to get everything within fair reach of his works.

At the annual meeting of the Newport (R. I.) Gas Light Company the following officers were elected: Directors, Henry Bull, Jr., A. K.

Quinn, Frederick Tompkins, Thos. A Lawton and Mellville Bull; President, Mellville Bull; Treasurer, Andrew K. Quinn. The business of the Company was remarkably good during the year. In fact the percentage gain in output for 1902 over 1901 was something over 20.

THE Pittsburg Plate Glass Company is arranging for the construction of an artificial gas plant at Kokomo, Ind.

I NOTICE your recent references to the change of ownership in the Isabella Gas Works, Frederick, Md., and send you the following respecting the present status of the concern. Articles incorporating the Peoples Gas Company, of Frederick have been filed in the Circuit Court with a capital stock of $25,000. The incorporators are Francis K. Casey and Edward P. Hill, of Baltimore, Md., Edwin C. Markell and Jacob Rohrback, of Frederick; and A. B. Beadle and Chas L. Serrill, of Philadelphia. The works will be rebuilt.

THE Minneapolis (Minn.) Gas Company will extend its main system to the outlying district of Lake Harriet.

A CORRESPONDENT forwards the following, under date of the 16th inst.: "Exceedingly satisfactory reports were presented to the stockholders at the annual meeting of the Atlantic City Gas and Water Company, yesterday afternoon. The corporation is probably the wealthiest located here. The following Board of Directors was elected: Savery Bradley, Jacob S. Disston, Thomas K. Reed, A. Louden Snowden, George A. Cotton, James Flaherty, Charles Evans, William Disston, George W. Elkins, Michael A. Devine, M. B. Feldmann, H. T. Hartman and Brinckle Gummey. The directors in turn chose the following officers: President, Savery Bradley; Vice-President, Jacob S. Disston; Secretary and General Manager, John P. Tompkins; Treasurer, Dr. Thos. K. Reed. After the meeting the shareholders enjoyed a satisfactory luncheon at the Brighton Hotel."

"W. F. R.," writing from Oroville (Cal.), under date of the 13th inst., says: "The Oroville Gas and Electric Power Company has virtually completed extensive improvements to the electric ligting system. A new power house has been built at the foot of Table Mountain, north of the old house and new dynamos installed. To-night the water pipe will be cut at the new location, and connection made with the water whels of the new plant. The new dynamos aggregate 230-horse power. They replace a dynamo of 120 horse power. The old machines will be removed to the new power house, and when all are in working order the Oroville electric lighting system will be driven by 350-horse power."

SOME weeks ago we had the satisfaction of reporting the return to active work of Mr. W. B. Keffer, Secretary of the Capital City Gas Light Company, of Des Moines, after an absence from his desk of many weeks, caused by illness. It was hoped and believed that he had entirely recovered, but the thought and belief were ill founded—more's the pity—a severe relapse incapacitated him to the point that the Company granted him a year's leave of absence, which period will be spent by him in California. May the best of results quickly follow his journey.

MESSRS. R. D. WOOD & Co. have been authorized by the American Gas Company to construct a storage holder at the Wakeska (Wis.) plant. It is to have a capacity of 250,000 cubic feet. The Company will also put down 5 miles of mains this summer.

A CORRESPONDENT in Lansing, Mich., writing under date of the 17th inst., incloses the following: "Mr. B. G. Dawes, of Marietta, Ohio, President of the Lansing Gas Light Company, was in the city some days ago, consulting with Secretary Walker, as to the affairs of the Company. He was pleased to receive some very surprising figures as to the consumption of gas since he became the chief owner of the plant here. In the 5 years the sale of gas has increased threefold. One of the greatest sources of increase is the sale of gas for fuel, and at present there are about 1,200 gas stoves used in the city. Five years ago there were only about 200 fuel taps. In the course of a talk with a newspaper reporter, Mr. Dawes called attention to the fact that Lansing people are getting their gas cheaper than those of any city of twice the size in the State. In the five years over $100,000 was expended in construction, and the Company has never declared a dividend. Although the market price of coke is something like $10 a ton and hard to get at that, the Company has not increased the price of this product. However, it is not taking any new orders now as much of it is used by the Company itself. Mr. Dawes is the President of a company which is having built the largest cantilever bridge in the country. It crosses the Ohio river at Marietta, and will be a toll bridge. The bridge is requiring much of his attention and he will not remain in Lansing long."

AT the annual meeting of the Willimantic (Conn.) Gas and Electric Light Company the officers chosen were: Directors, George A. Lewis, D. F. Tilley, Edwin Evans, Emerson Stone and J. F. Church; President, J. F. Church; Secretary, Edwin Evans; Treasurer, G. A. Lewis

MR. JOHN I. BEGGS has been elected President of the Racine (Wis.) Gas Light Company; Vice, Mr. E. G. Cowdery, resigned. Mr. Cowdery remains on the Board of Directors.

THE Directors of the Louisville (Ky.) Gas Company have delared a semi-annual dividend of 5 per cent. The earnings for the half year were in excess of a 7 per cent. rate.

THE Paris (Ills.) Gas Light and Coke Company is comfortably settled in its handsome new offices on North Main street.

THE Los Angeles *Daily Times* recently had this to say respecting the Los Angeles Lighting Company: The Los Angeles Lighting Company, which supplies all the gas used in Los Angeles for lighting and fuel, was incorporated on November 14, 1889, succeeding principally to a business established in 1867. The price of gas in 1889 was $2.50 per thousand cubic feet. Upon the acquisition of the old plants, the price was immediately reduced to $2.25 per thousand, many solicitors were put into the field, an appliance department was opened, and liberal extensions of mains were made. With the accession of business the rate was reduced, step by step, until to-day the price of gas is $1 per thousand cubic feet, comparatively the lowest gas rate in the United States. During the year just passed the company has gained 5,525 new meters, and has laid 46 miles of new mains. The company is now supplying nearly 20,000 consumers through 200 miles of main pipe. It is safe to say that no gas company in the United States, operating in a city of similar size, can show anywhere as near so good a record. The company's new business is out of all proportion to the city's phenomenal growth. It is the result of steady, concentrated effort of people who understand their business and are not neglecting it. With the increase in business there has been a corresponding enlargement of the company's works, and the acquisition of new lands for the plant. There has recently been completed a new oil gas prosess, with a capacity of 1,000,000 cubic feet per day, and the order has just been placed for another set of this apparatus, of like capacity. This is the newest process in gas manufacture, and was adopted by the company as soon as it proved to be meritorious. This is the third process of making gas in use by the company, the others being a modern water gas plant, recently enlarged and improved and a coal gas plant, just rebuilt. These three plants give the company an enormous capacity, and the advantage of producing gas at the lowest possible cost, each system of making gas having some advantages of its own. Certainly this equipment bespeaks a keeping up with the times. A new gasholder of 500,000 cubic feet capacity was installed a year ago, and another holder of 1,000,000 cubic feet capacity is on the way for completion during February next. The system of distribution is the latest, gas being delivered under both low and high pressure. For any extended deliveries of gas under high pressure this company is the pioneer, and has taken hold of and worked out the system of high-pressure delivery, through small mains, where no other large artificial gas company in the United States has dared to take the initiative. There is no new and tried improvement in the art of making gas that the company has not availed itself of, and this must be of close interest to the consumer; for, manifestly, his interest must be more safe in the hands of alert and intelligent dealers, who thoroughly understand the mutual advantages of low prices and good service. So great has been the growth of the company's business under the policy of the lowest price commensurate with a fair return on the company's investment, that the number of employees on the company's pay rolls has been doubled within five years; so that, at present, its large offices and storerooms at the corner of Fifth street and Broadway, containing 23,000 square feet of floor space, are totally inadequate for its needs. The company has purchased a lot on Hill street between Sixth and Seventh streets, and plans for its new three-story building are in the hands of Architect John Parkinson. The building will be completed by May next. The Company's gas appliance department is a prominent feature of its hustling methods. Sixty-seven men and 15 wagons are kept busy by this department selling and setting stoves, water heaters, Welsbach lights, gas fixtures and in piping houses. All work from this department is done at cost price. Appliances are sold on the installment plan, a free cooking school is maintained, solicitors are kept on a house-to-house canvass throughout the city, and nothing is left undone to acquaint people with and induce them to use gas. Chief among the virtues of this company, if a gas company may be said to have any virtues, is its readiness to extend mains as fast as reasonable application is made. No charge is made for running service pipes or setting meters. The candle power of the gas is maintained at the highest standard, and is tested daily on a bar photometer of modern type. The photometer is very elaborate, and is contained in a dark room especially devoted to its use. It requires about three-quarters of an hour to make a candle power test. The engineering department of the company has draughtsmen continually employed on its plans of improvement and repair work, and all data of a technical nature, and the working out of problems concerned in the careful management of the least details of manufacture and distribution, pass through this department. A general superintendent is assisted by a superintendent of manufacture, and a superintendent of distribution. The company is a heavy taxpayer, the expense being $1,163.10 per month. Its franchise is assessed at $250,000. In addition, it pays a license of $100 per month. Its employees are selected strictly from residents of Los Angeles, and the salaries paid are unquestionably above the average. It requires no overtime work, looking at all times with kindest consideration and appreciation toward everyone connected with its establishment. Altogether, this institution is a model of its kind. In its nature it is a monopoly. One management, one set of mains and one gas works are certainly operated more cheaply than two, and if, as it is claimed, the difference between the cost and selling price of the gas is merely a fair rate of interest upon the investment, and at $1 per 1,000 cubic feet this would appear to be so. Then this is a monopoly that in no sense suggests oppression, but is, on the contrary, a decided benefit to the consumer. So long as monopolies are operated in a spirit of mutual protection there is no harm in them, but good.

The Market for Gas Securities.

The quotations for Consolidated continue to show weakness, which untoward state is undoubtedly owing to the uncertainty of the money market and the fear of the speculators that the United States will become actively mixed up in the row that is now going on in South America. Why that possibility should cause weakness or strength in Consolidated gas is beyond us. The close to-day (Friday) was made at 215½ to 216. The annual meeting of the Company will be held Monday.

Brooklyn Union sympathizes with its big neighbor. During the week 100 shares sold at 225, and it closed at 220 to 226. It should be selling at 250. Baltimore Consolidated is practically unchanged at 70½ to 72, and Peoples, of Chicago, is steady. The Company's earnings are increasing all the time. Lacledes, both common and preferred, are inquired for at figures rather better than those that have prevailed in them for some time back. The gas bond market is active, and quotations show steady advances in all well authenticated issues.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

16 Wall Street, New York City.

January 26.

☞All communications will receive particular attention.

☞The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$73,177,000	100	215½	216
Central Union, Bonds, 5's.	3,000,000	1,000	110	112
Equitable Bonds, 6's	1,000,000	1,000	105	
" 1st Con. 5's	2,300,000	1,000	118	120
Metropolitan Bonds	658,000	..	108	112
Mutual	3,500,000	100	350	..
Municipal Bonds	750,000	..	..	..
New Amsterdam Gas Co. ..				
Bonds, 5's	11,000,000	1,000	112½	113
Northern Union, Bonds, 5's.	1,250,000	1,000	108	110
New York and East River				
Bonds 1st 5's	3,500,000	1,000	112	113
" 1st Con. 5's	1,500,000	..	109	111
Standard	5,000,000	100	130	140
Preferred	5,000,000	100	150	160
Bonds, 1st Mortgage, 5's	1,500,000	1,000	115½	118
Yonkers	299,650	500	130	
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	220	226
" " Bonds (5's)	15 000,000	1,000	119	119½
Bay State	50,000,000	50	1	1¼
" Income Bonds	2,000,000	1,000	.	76
Binghamton Gas Works	450,000	100	28	30
" 1st Mtg. 5's	509,000	1,000	93	96
Boston United Gas Co.—				
1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	7½	10
" " Bonds, 5's	5,250,000	1,000	75	77
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000		
Central San Francisco	900,000	..	106	108
Chicago Gas Co. Guaranteed Gold Bonds	7,650,000	1,000	104	104¼
Cincinnati Gas & Elec. Co.	29,500,000	100	99½	101
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	101	101½
Columbus (O.) Gas Lt. & Heating Co	1,682,750	100	88¾	89½
Preferred	3,026,500	100	107½	1
Consumers, Jersey City Bonds	600,000	1,000	103	106
Consumers, Toronto	1,700,000	50	218	225
Consolidated, Baltimore	11,000,000	100	70¼	72
Mortgage, 6's	3,600,000	..	..	118
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's	1,490 000	..	..	112
Consolidated Gas Co. of N.J.	1,000,000	100	15	17
" Con. Mtg. 5's	380,000	1,000	85	87
Consolidated G. & E. Co.'s.				
Little Falls, N.Y.	90,000	100	..	100
Bonds	75,000	..	..	100
Detroit City Gas Co.	4,825,500	50	.	89
" Prior Lien 5's	5,603,000	1,000	99½	100
Detroit Gas Co., 5's	881,000	1,000	77	79
" Inc. 5's	16,000	100	94	94½
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Essex and Hudson Gas Co.	6,500,000	..	34	38
Fort Wayne	2,000,000	..	.	.
" Bonds	2,000,000	..	55	..
Grand Rapids Gas Lt. Co. 1st Mtg. 5's	1,225,000	1,000	104½	105
Hartford	750,000	25	245	265
Hudson County Gas Co., of New Jersey	10,500,000	..	25	..
" Bonds, 5's	10,500,000	..	101	103
Indianapolis	2,000,000	..	.	68½
" Bonds, 6's	2,650,000	..	102	105
Jackson Gas Co	250,000	50	73	75
" 1st Mtg. 5's	290,000	1,000	101	102½
Kansas City Gas Light Co., of Missouri	5,000,000	100	..	36
Bonds, 1st 5's	3,822,000	1,000	102	104
Laclede, St. Louis	13,000,000	100	85	86
Preferred	2,500,000	100	95	105
Bonds	10,000,000	1,000	109½	110
Lafayette Gas Co., Ind.	1,000,000	100		60
Bonds	1,000,000	1,000	60	65
Louisville	2,570,000	50	112	120
Madison Gas & Elec. Co.				
" 1st Mtg. 6's	350,000	1,000	107½	108½
" 6 per cent. scrip, due 1910	100,000	25	25	87
Montreal, Canada	2,000,000	100	218	184¾
Newark, N. J., Con. Gas Co	6,000,000	..	56	58
Bonds, 6's	4,600,000	..	105	105¾
New Haven	1,000,000	25	300	325
Nashville Gas Lt. Co.	1,000,000	100	110	..
Oakland, Cal.	2,000,000	..	46	47
" Bonds	750,000	..	..	..
Peoples G. L. & Coke Co., of Chicago	25,000,000	100	103½	104

Advertisers' Index.

GAS ENGINEERS.

	Page
A. E. Boardman, Brevard, N. C.	152
Baxter & Young, Detroit, Mich.	152
David Leavitt Hough, New York City	152
Economical Gas Apparatus Construct'n Co., Toronto, Ont.	142
Frank D. Moses, Trenton, N. J.	139
Fred. Bredel, Milwaukee, Wis.	142
Geo. R. Rowland, New York City	142
Humphreys & Glasgow, New York City	153
Kerr Murray Mfg. Co., Fort Wayne, Ind.	152
The Gas Machinery Co., Cleveland, O.	139
The Jeffrey Manufacturing Co., Columbus, O.	149
The Western Gas Construction Co., Fort Wayne, Ind.	160
United Gas Improvement Co., Philadelphia, Pa.	147
Wm. Henry White, New York City	155

GAS WORKS APPARATUS AND CONSTRUCTION.

A. E. Boardman, Brevard, N. C.	152
Bartlett, Hayward & Co., Baltimore, Md.	153
Baxter & Young, Detroit, Mich.	152
Christopher Cunningham, Brooklyn, N.Y.	149
Connelly Iron Sponge and Governor Co., New York City	143
Continental Iron Works, Brooklyn, N. Y.	154
Davis and Farnum Mfg. Co., Waltham, Mass.	152
Deily & Fowler, Philadelphia, Pa.	156
Economical Gas Apparatus Construct'n Co., Toronto, Ont.	142
Frank D. Moses, Trenton, N. J.	139
Fred. Bredel, Milwaukee, Wis.	142
G. Shepard Page's Sons, New York City	152
Humphreys & Glasgow, New York City	153
Isbell-Porter Company, New York City	154
Kerr Murray Mfg. Co., Fort Wayne, Ind.	152
Lloyd Construction Co., Detroit, Mich.	142
Logan Iron Works, Brooklyn, N. Y.	156
Quintard Iron Works, New York City	153
R. D. Wood & Co., Philadelphia, Pa.	154
Riter-Conley Mfg. Co., Pittsburg, Pa.	155
Stacey Mfg. Co., Cincinnati, O.	155
The Connersville Blower Company, Connersville, Ind.	157
The Gas Machinery Co., Cleveland, O.	139
The Jeffrey Manufacturing Co., Columbus, O.	149
The Western Gas Construction Co., Fort Wayne, Ind.	160
United Gas Improvement Co., Philadelphia, Pa.	147

PROCESSES.

Bartlett, Hayward & Co., Baltimore, Md.	153
B. E. Chollar, St. Louis, Mo.	138
Burdett Loomis, Hartford, Conn.	154
Economical Gas Apparatus Construct'n Co, Toronto, Ont.	142
Humphreys & Glasgow, New York City	158
The Western Gas Construction Co., Fort Wayne, Ind.	160
United Gas Improvement Co., Philadelphia, Pa.	147

SCRUBBERS AND CONDENSERS.

Continental Iron Works, Brooklyn, N.Y.	154
Kerr Murray Mfg. Co., Fort Wayne, Ind.	152
Logan Iron Works, Brooklyn, N. Y.	156
R. D. Wood & Co., Philadelphia, Pa.	154
Riter-Conley Mfg. Co., Pittsburg, Pa.	155
The Western Gas Construction Co., Fort Wayne, Ind.	160

PRODUCER POWER PLANTS.

R. D. Wood & Co., Philadelphia, Pa.	154

TAR AND CARBONIC ACID EXTRACTOR.

The Western Gas Construction Co., Fort Wayne, Ind.	160

AMMONIA CONCENTRATORS.

Michigan Ammonia Works, Detroit, Mich.	140
The Western Gas Construction Co., Fort Wayne, Ind.	160

GAS METERS.

American Meter Co., New York and Philadelphia	159
Detroit Meter Company, Detroit, Mich.	159
D. McDonald & Co., Albany, N.Y.	157
Helme & McIlhenny, Philadelphia, Pa.	159
John J. Griffin & Co., Philadelphia, Pa.	120
Keystone Meter Co., Royersford, Pa.	158
Maryland Meter and Mfg. Co., Baltimore, Md.	158
Metric Metal Co., Erie, Pa.	159
Nathaniel Tufts Meter Co., Boston, Mass.	158

PREPAYMENT METERS.

American Meter Co., New York and Philadelphia	159
D. McDonald & Co., Albany, N. Y.	157
Helme & McIlhenny, Philadelphia, Pa.	159
John J. Griffin & Co., Philadelphia, Pa.	120
Keystone Meter Co., Royersford, Pa.	158
Nathaniel Tufts Meter Co., Boston, Mass.	158

PREPAYMENT METER ATTACHMENTS.

Reeves Mfg. Co., New Haven, Conn.	138

GAS AND WATER PIPES.

Christopher Cunningham, Brooklyn, N.Y.	149
Donaldson Iron Co., Emaus, Pa.	144
M. J. Drummond & Co., New York City	144
R. D. Wood & Co., Philadelphia, Pa.	144
Warren Foundry and Machine Co., New York City	144

GAS MAIN STOPPERS.

Safety Gas Main Stopper Co., N.Y. City	144

GAS TAPPING MACHINES.

George Light, Dayton, O.	144
H. Mueller Manufacturing Company, Decatur, Ills.	141

GAS COALS.

Berwind-White Coal Mining Co., New York and Phila.	150
Perkins & Co., New York City	150
Westmoreland Coal Co., Philadelphia, Pa.	151

CANNEL COALS.

Perkins & Co., New York City	150

AUTOMATIC WEIGHING MACHINERY.

Richardson Scale Co, New York City	135

CONVEYORS.

Akron Cultivator Co., Akron, O.	138
C. W. Hunt Company, New York City	141
Kerr Murray Mfg. Co., Fort Wayne, Ind.	152
The Jeffrey Manufacturing Co., Columbus, O.	149
The Link-Belt Machinery Co., Chicago, Ills.	151
The Western Gas Construction Co., Fort Wayne, Ind.	160

CHARGING BARROWS & COAL WAGONS.

Akron Cultivator Co., Akron, O.	138
Kerr Murray Mfg. Co., Fort Wayne, Ind.	152

GAS ENRICHERS.

Gulf Refining Co., Pittsburg, Pa.	150
Standard Oil Co., New York City	111
The Sun Oil Co., Pittsburg, Pa.	151

COKE CRUSHERS.

C. M. Keller, Columbus, Ind.	151
The Jeffrey Manufacturing Co., Columbus, O.	149

STEAM BLOWER FOR BURNING BREEZE.

H. E. Parson, Brooklyn, N. Y.	144
The Connersville Blower Company, Connersville, Ind.	157

ECONOMIZERS.

Green Fuel Economizer Co., Matteawan, N.Y.	188

GAS GAUGES.

The Bristol Co., Waterbury, Conn.	149

GAS GOVERNORS.

Connelly Iron Sponge and Governor Co., New York City	143
Isbell-Porter Co., New York City	154
R. D. Wood & Co., Philadelphia, Pa.	154

CEMENTS.

C. L. Gerould, Galesburg, Ills.	148

RETORTS AND FIREBRICKS.

Adam Weber Sons, New York City	148
Baltimore Retort and Firebrick Co., Baltimore, Md.	148
Brooklyn Firebrick Works, Brooklyn, N. Y.	148
Cyrus Borgner, Philadelphia, Pa.	148
Henry Maurer & Son, New York City	148
James Gardner, Jr., Co., Pittsburg, Pa.	148
J. H. Gautier & Co., Jersey City, N. J.	148
Laclede Firebrick Mfg. Co., St. Louis, Mo.	148
Missouri Firebrick Co., St. Louis, Mo.	148
Parker-Russell Mining and Mfg. Co., St. Louis, Mo.	136

INCLINED RETORTS.
Adam Weber Sons (Graham, Morton [England] System) 148

VERTICAL S'S.
Adam Weber Sons (Oscar B. Weber's Construction)..... 148

REGENERATIVE FURNACES.
Adam Weber Sons, New York City..... 148
Bartlett, Hayward & Co., Baltimore, Md..... 153
Fred. Bredel, Milwaukee, Wis..... 149
J. H. Gautier & Co., Jersey City, N.J..... 148
Laclede Firebrick Mfg. Co., St. Louis, Mo..... 148
Missouri Firebrick Co., St. Louis, Mo. 148
Parker-Russell Mining and Mfg. Co., St. Louis, Mo..... 148

SELF-SEALING MOUTHPIECE DOORS.
Continental Iron Works, Brooklyn, N.Y..... 154
Isbell-Porter Co., New York City..... 154
Kerr Murray Mfg. Co., Fort Wayne, Ind..... 152
Logan Iron Works, Brooklyn, N.Y..... 156
R. D. Wood & Co., Philadelphia, Pa..... 154
The Western Gas Construction Co., Fort Wayne, Ind... 160

CHIMNEY CONSTRUCTION.
Adam Weber Sons, New York City..... 148

INCANDESCENT GAS LAMPS.
Ball Check Light Co., New York City..... 139
Detroit Arc Gas Light Co., Detroit, Mich.... 140
D. M. Steward Mfg. Co., Chattanooga, Tenn..... 140
General Gas Light Company, Kalamazoo, Mich..... 136
Welsbach Company, Gloucester, N. J..... 145

GAS MANTLES.
Lindsay & Co., Chicago, Ills..... 140

BURNERS.
C. A. Gefrorer, Philadelphia, Pa..... 140
D. M. Steward Mfg. Co., Chattanooga, Tenn..... 140
Sunlight Lava Mfg. Co., Chattanooga, Tenn..... 100
Wm. M. Crane Co., New York City..... 141

LAVA GAS TIPS.
D. M. Steward Mfg. Co., Chattanooga, Tenn..... 140
Sunlight Lava Mfg. Co., Chattanooga, Tenn..... 100

STREET LAMPS.
Thos. T. W. Miner, New York City..... 141
Welsbach Street Lighting Co., New York and Phila.... 146

PURIFIERS.
Kerr Murray Mfg. Co., Fort Wayne, Ind..... 152
R. D. Wood & Co., Philadelphia, Pa..... 154
Stacey Mfg. Co., Cincinnati, O..... 155
The Western Gas Construction Co., Fort Wayne, Ind... 160

PURIFYING MATERIALS.
Connelly Iron Sponge and Governor Co., New York City 143

VALVES.
Continental Iron Works, Brooklyn, N. Y..... 154
Isbell-Porter Co., New York City 154
Kerr Murray Mfg. Co., Fort Wayne, Ind 152
Ludlow Valve Manufacturing Co., Troy, N.Y..... 141
R. D. Wood & Co., Philadelphia, Pa 154
The P. H. & F. M. Roots Co., Connersville, Ind..... 108
The Western Gas Construction Co., Fort Wayne, Ind.... 160

EXHAUSTERS.
Connelly Iron Sponge and Governor Co., New York City 143
Isbell-Porter Company, New York City..... 154
Kerr Murray Mfg. Co., Fort Wayne, Ind..... 152
The Connersville Blower Company, Connersville, Ind... 153
The P. H. & F. M. Roots Co., Connersville, Ind..... 108

ELECTRICAL APPARATUS.
Wm. Henry White, New York City..... 155

PURIFIER SCREENS.
John Cabot, New York City 149

GAS STOVES.
American Meter Co., New York and Philadelphia..... 145
Keystone Meter Co., Royersford, Pa..... 158
Maryland Meter and Manufacturing Co., Baltimore, Md 158
Nathaniel Tufts Meter Co., Boston Mass..... 158

HOT WATER HEATERS.
The Humphrey Mfg. and Plating Co., Kalamazoo, Mich. 144

GASHOLDER TANKS.
J. P. Whittier, Brooklyn, N.Y..... 142

GASHOLDERS.
Bartlett, Hayward & Co., Baltimore, Md..... 155
Continental Iron Works, Brooklyn, N.Y..... 154
Davis & Farnum Mfg. Co., Waltham, Mass..... 152
Deily & Fowler, Philadelphia, Pa..... 156
Kerr Murray Mfg. Co., Fort Wayne, Ind..... 152
Logan Iron Works, Brooklyn, N.Y..... 156
R. D. Wood & Co., Philadelphia, Pa..... 154
Riter-Conley Mfg. Co., Pittsburg, Pa..... 155
Stacey Mfg. Co., Cincinnati, O..... 155

STORAGE TANKS.
Christopher Cunningham, Brooklyn, N.Y..... 149

AUTOMATIC SCALES.
Richardson Scale Co., New York City..... 135

INVESTORS.
W. R. Faben Construction Company, Toledo, O..... 140

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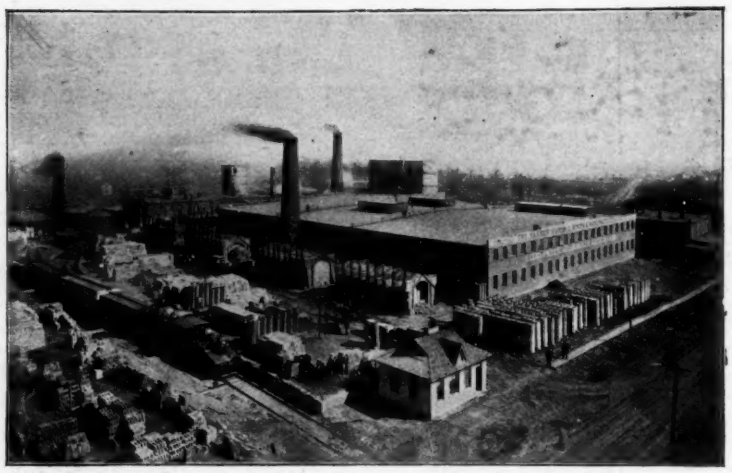

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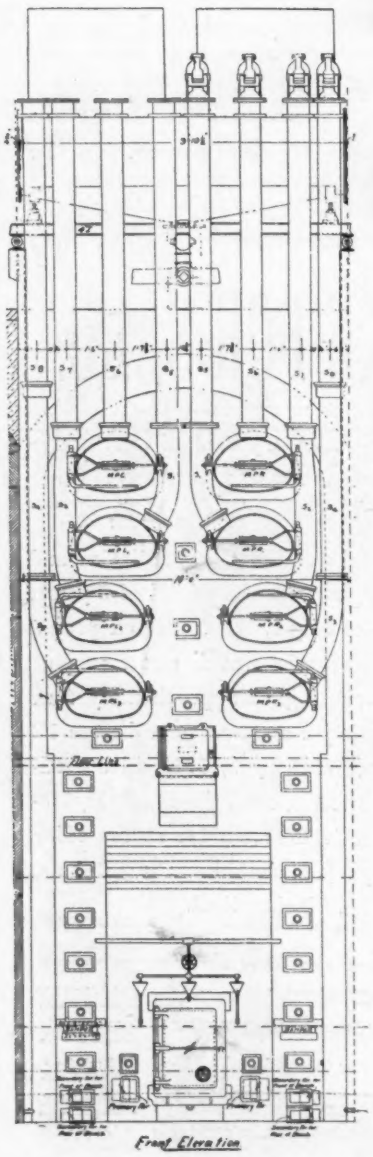

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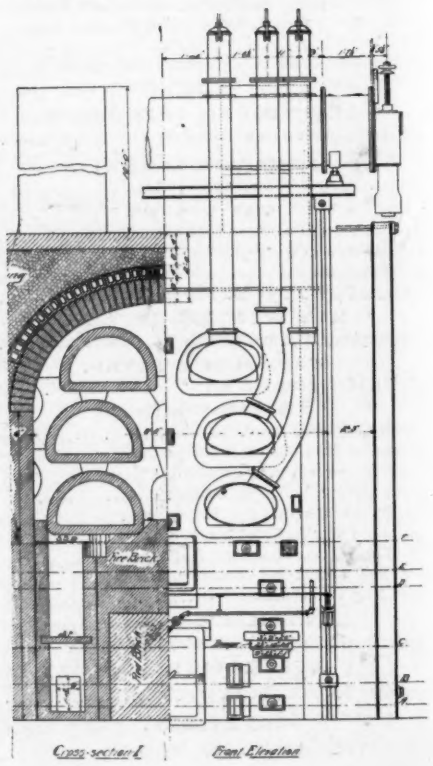

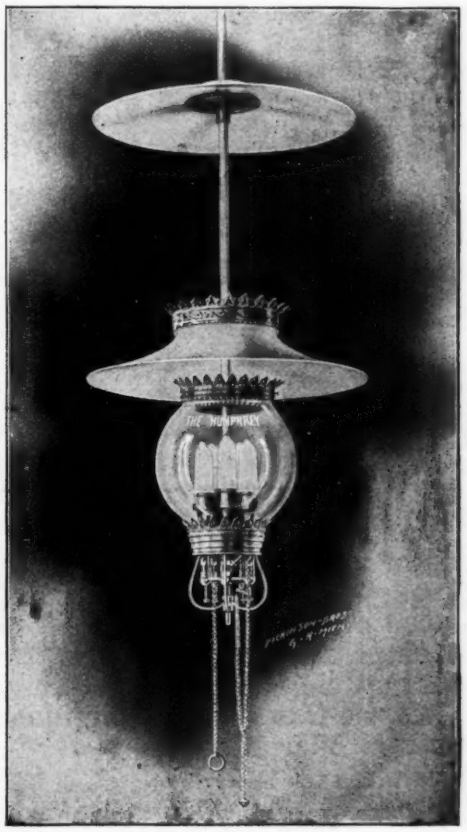

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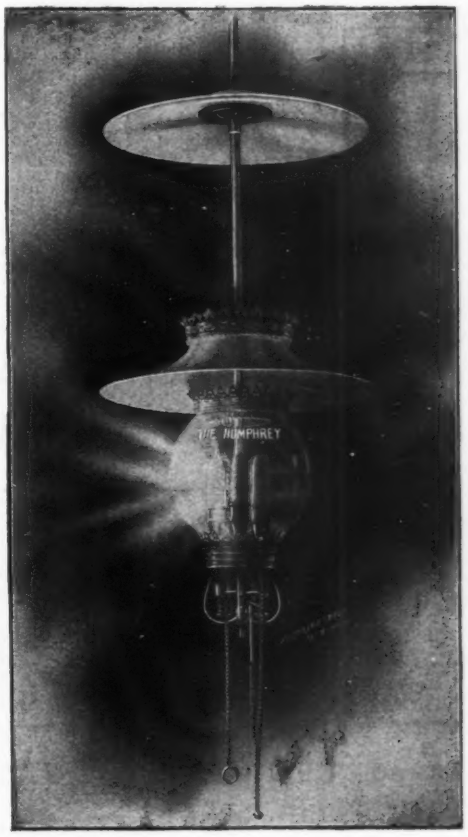

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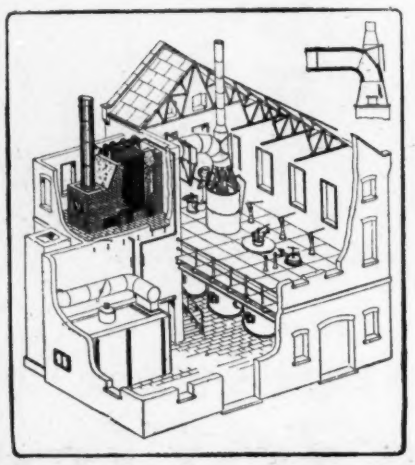

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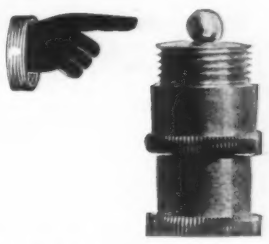

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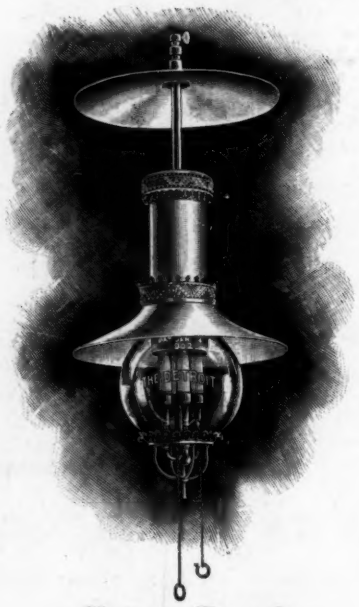

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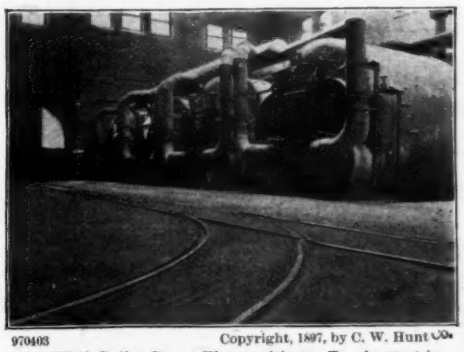

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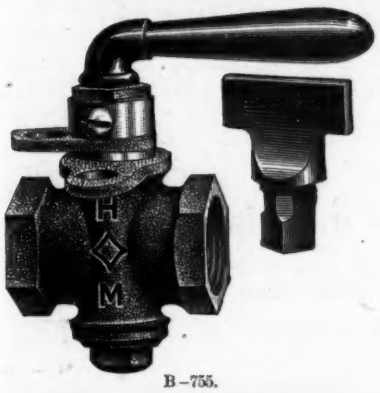

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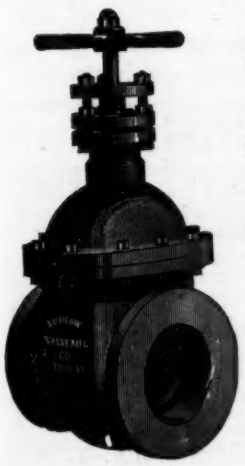

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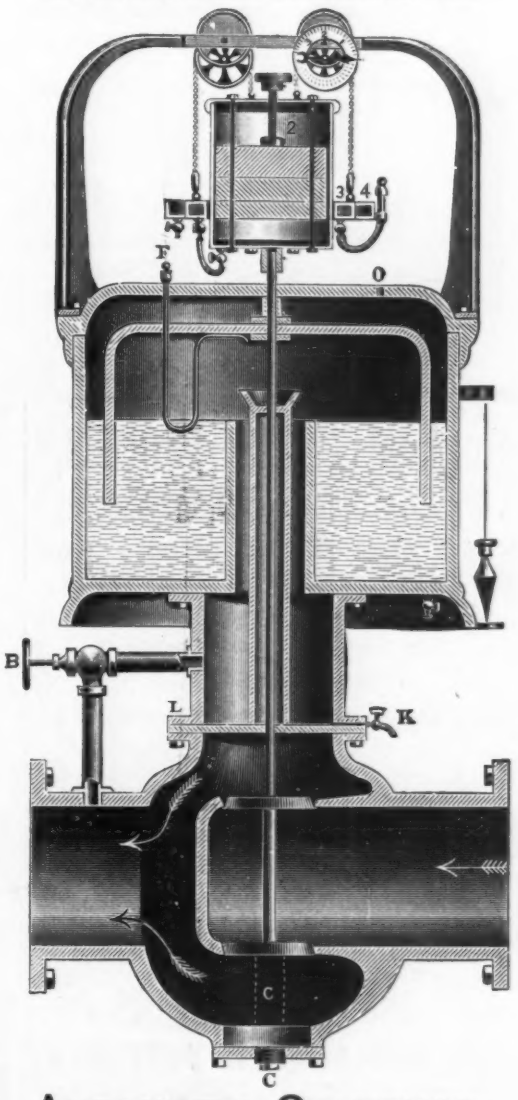

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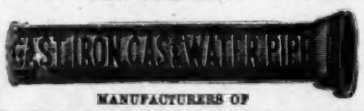

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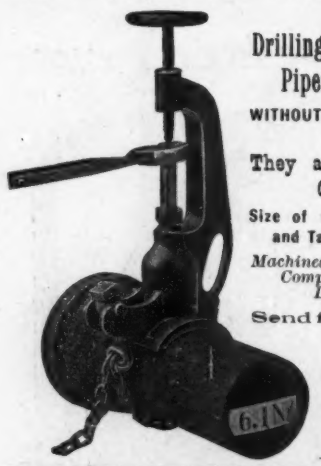

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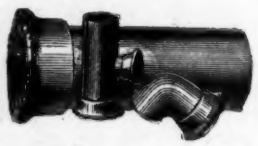

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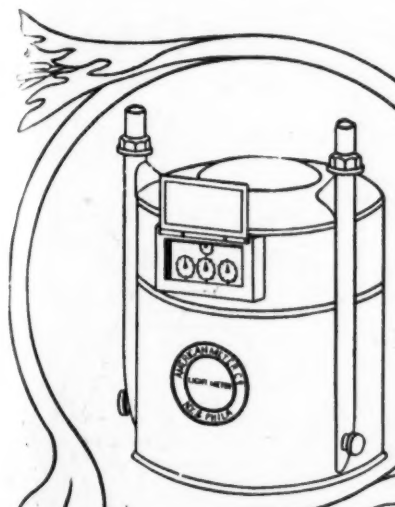

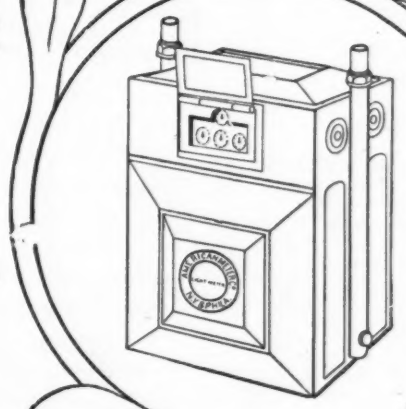

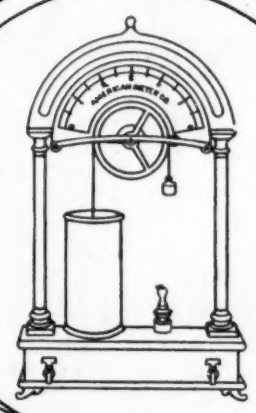

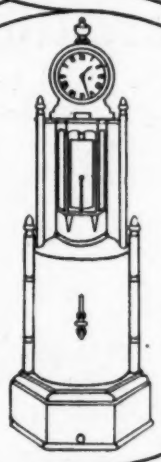

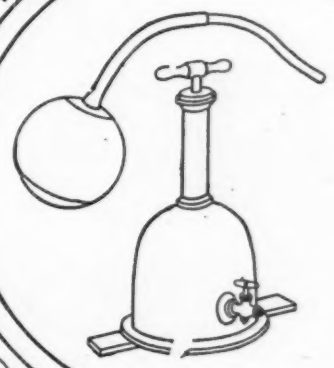

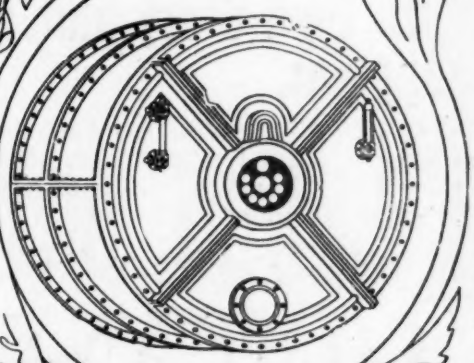

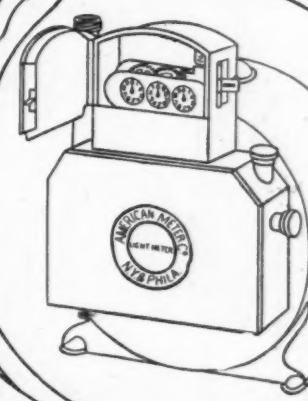

PUBLIC LIGHTING TABLE.

FEBRUARY, 1903.

Day of Week.	Date.	Table No. 1. Following the Moon. Light.	Extinguish.	Table No. 2. New York City. All Night Lighting. Light.	Extinguish.
				P.M.	A.M.
Sun.	1	5.50 PM	6.10 AM	5.05	6.15
Mon.	2	9.30	6.10	5.05	6.15
Tue.	3	10.30	6.10	5.05	6.15
Wed.	4	11.30 FQ	6.10	5.05	6.15
Thu.	5	12.40 AM	6.10	5.10	6.10
Fri.	6	1.40	6.10	5.10	6.10
Sat.	7	2.40	6.10	5.10	6.10
Sun.	8	3.40	6.00	5.10	6.10
Mon.	9	4.30	6.00	5.10	6.10
Tue.	10	No L.	No L.	5.10	6.10
Wed.	11	No L. FM	No L.	5.10	6.10
Thu.	12	No L.	No L.	5.20	5.55
Fri.	13	6.00 PM	8.50 PM	5.20	5.55
Sat.	14	6.00	9.50	5.20	5.55
Sun.	15	6.10	11.00	5.20	5.55
Mon.	16	6.10	12.00	5.20	5.55
Tue.	17	6.10	1.00 AM	5.20	5.55
Wed.	18	6.10 LQ	2.00	5.20	5.55
Thu.	19	6.10	2.50	5.30	5.55
Fri.	20	6.10	3.40	5.30	5.55
Sat.	21	6.10	4.30	5.30	5.55
Sun.	22	6.20	5.10	5.30	5.55
Mon.	23	6.20	5.40	5.30	5.55
Tue.	24	6.20	5.40	5.30	5.55
Wed.	25	6.20	5.40	5.30	5.55
Thu.	26	6.20 NM	5.40	5.30	5.45
Fri.	27	6.20	5.40	5.30	5.45
Sat.	28	6.20	5.40	5.30	5.45

TOTAL HOURS LIGHTING DURING 1903.

By Table No. 1.	Hrs. Min.	By Table No. 2.	Hrs. Min.
January	245.00	January	423.20
February	192.00	February	355.25
March	201.00	March	355.35
April	167.20	April	298.50
May	152.00	May	264.50
June	131.00	June	234.25
July	140.40	July	243.45
August	156.20	August	280.25
September	171.20	September	321.15
October	198.20	October	374.30
November	216.30	November	401.40
December	232.10	December	433.45
Total, yr.	2203.40	Total, yr.	3987.45

NEW YORK, 33 Nassau Street. PHILADELPHIA, Broad and Arch Streets. CHICAGO, Foot of Orleans Street. BOSTON, 624 Tremont Building.
CLEVELAND, 809 Cuyahoga Building. ST. LOUIS, 712 Roe Building. SAN FRANCISCO, 712 Polk Street.

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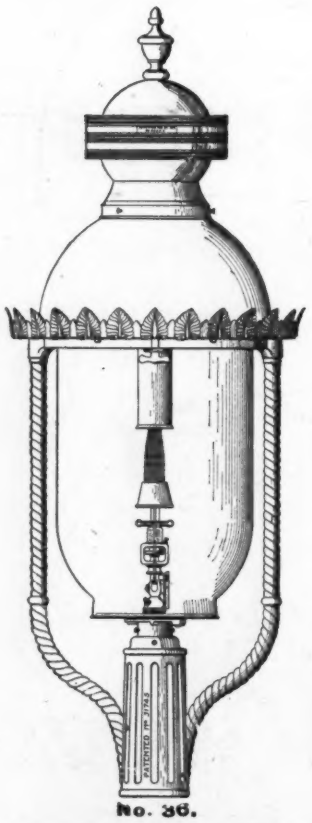
.... OF AMERICA ....



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Let us send you one lamp—doesn't cost a fortune—and it will answer every question you put to it; make good on every test given it. You know the only proof of the pudding? What's the use in a fellow telling you it tastes good? Taste it yourself, then you know.

May we Send you ONE Lamp?

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Auburn, N. Y.	Houston, Tex.	Ocean City, N. J.
Belmar, N. J.	Indianapolis, Ind.	Oklahoma City, O. T.
Blue Island, Ills.	Jersey City, N. J.	Oneonta, N. Y.
Boonton, N. J.	Laconia, N. H.	Plainfield, N. J.
Brooklyn, N. Y.	Lakewood, N. J.	Portland, Me.
Carlisle, Pa.	La-Salle-Peru, Ills.	Pottsville, Pa.
Champaign, Ills.	Martinsville, Ind.	Scranton, Pa.
Coney Island, N. Y.	Memphis, Tenn.	South Brooklyn, N. Y.
Dallas, Tex.	Newark, N. J.	Suffern, N. Y.
Danville, Ills.	New Brunswick, N. J.	Swedesboro, N. J.
Des Moines, Ia.	New London, Conn.	Syracuse, N. Y.
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TOTAL DAILY CAPACITY, 1902, . . 32,825,000 cubic feet.
TOTAL SETS TO DATE, ... 447
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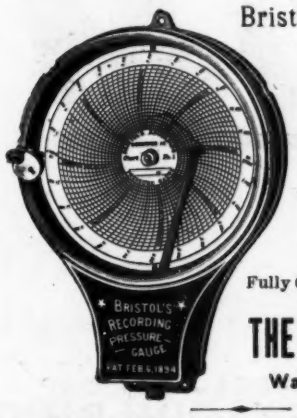

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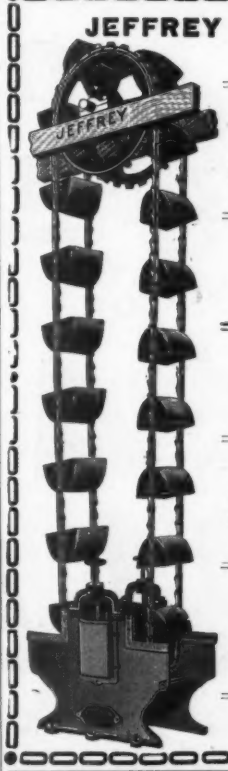

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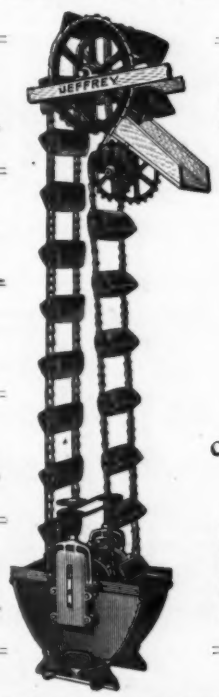

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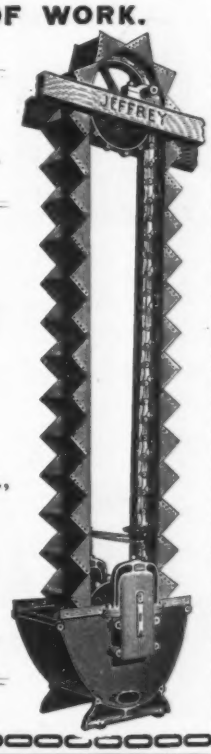

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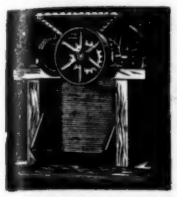

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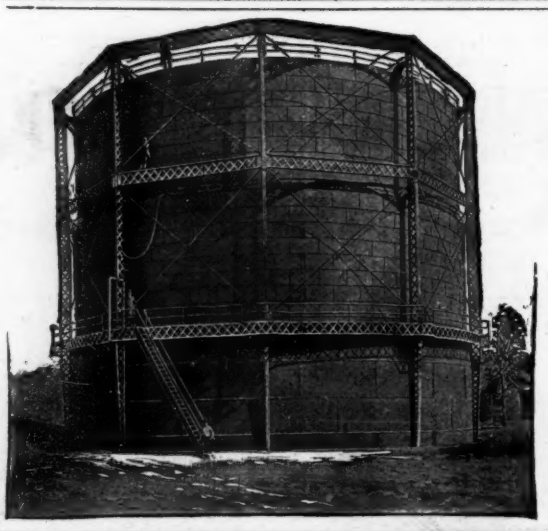

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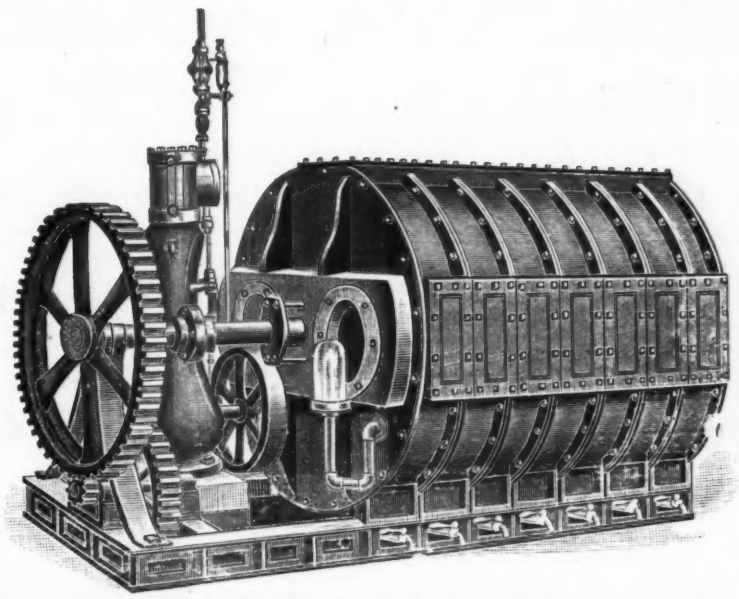

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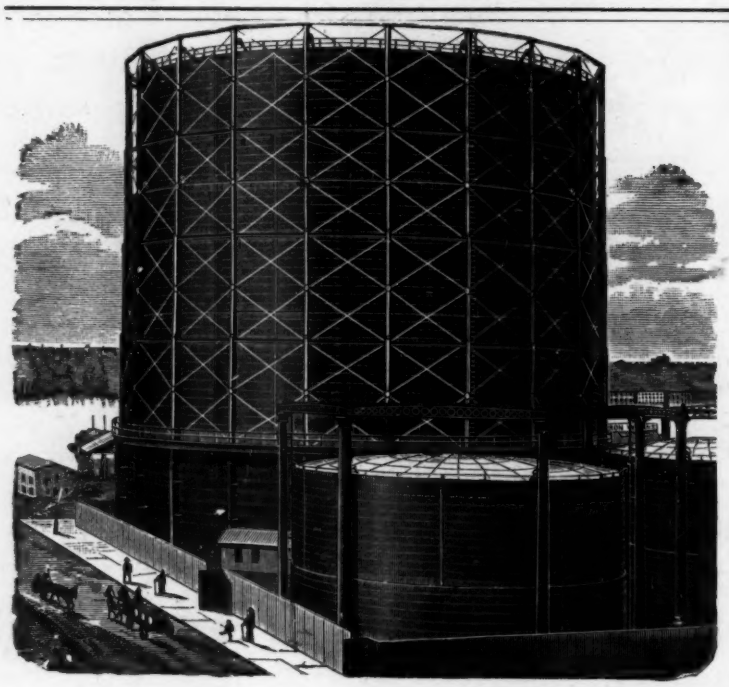

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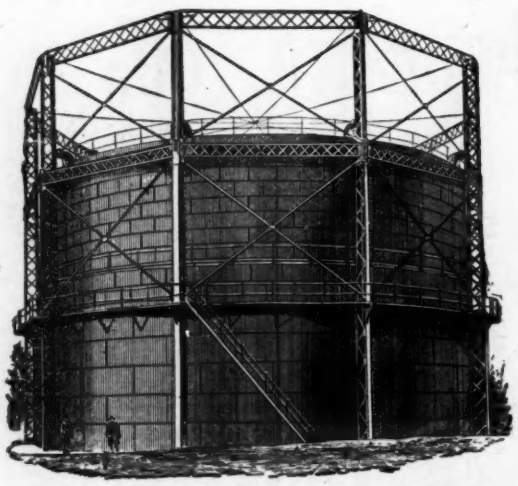

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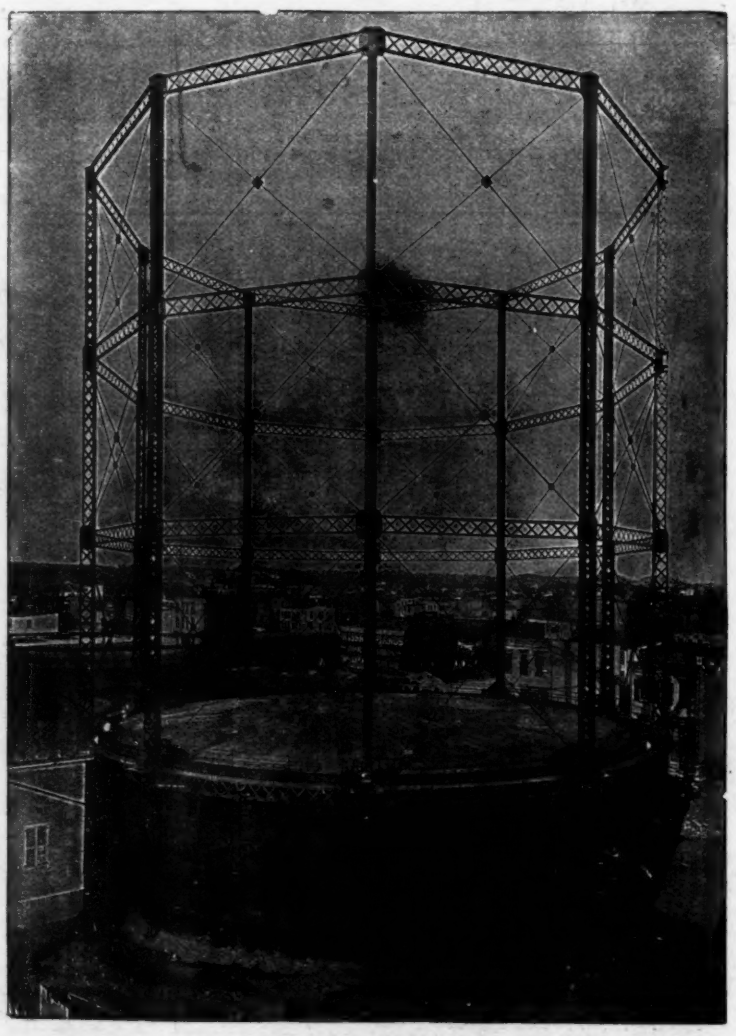

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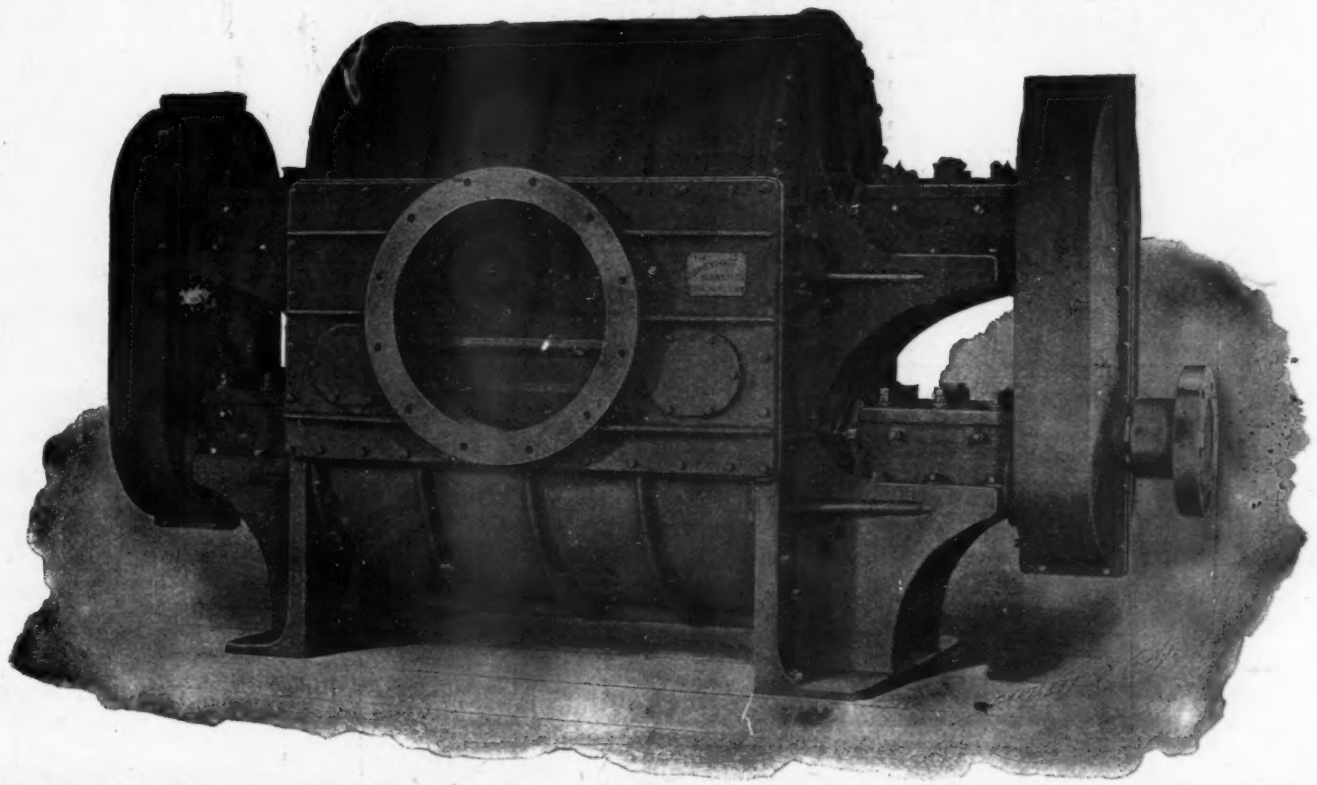

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